THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

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GAS PURIFICATION
BY
OXIDE OF IRON.

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JOSEPH COWEN and CO.,
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Were the only parties to whom a Prize Medal was awarded at the Great Exhibition of 1851, for "Gas-Retorts and other Objects in Fire-Clay," and they were also awarded at the International Exhibition of 1862, the Prize Medal for "Gas-Retorts, Fire-Bricks, &c., for Excellence of Quality."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
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Established at the commencement of Gas Lighting,
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THREE PRIZE MEDALS,
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Head London Office:
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OLD PATENT TUBE-WORKS, WEDNESBURY.

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PATENT COMPENSATING METERS
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Established 1830.

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MANUFACTURERS OF
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
Sugar, Saltpetre, and all kinds of Pans.
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JAMES E. & SAMUEL SPENCER, Agents.

THE
"OTTO" GAS-ENGINE.
See Advertisement in last week's JOURNAL, page 6.

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MANCHESTER AND LONDON.

THE
DUKE OF HAMILTON'S
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CANNEL COAL.
AGENT:
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ESTABLISHED 1840.

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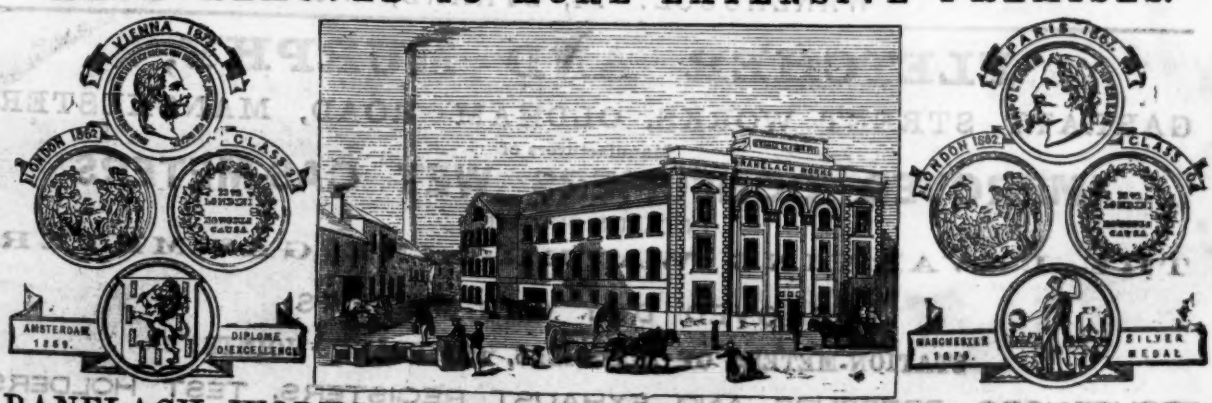
DRY GAS-METER MANUFACTURERS,
HAVE REMOVED TO MORE EXTENSIVE PREMISES:



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WELLINGTON TUBE WORKS,

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GAS, STEAM, AND HYDRAULIC TUBES AND FITTINGS.

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Has on Sale a large quantity of Cannel, South Yorkshire, Wigan, and Ruabon Coal, purchased previous to the late advances.

Prices on Application.

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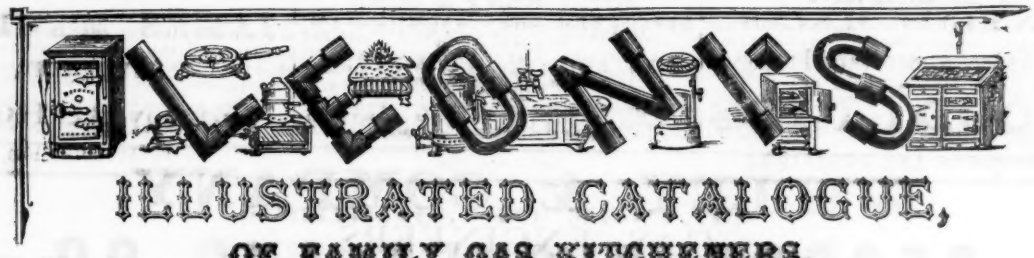
GAS APPARATUS;

CONTRACTORS FOR THE

ERECTION OF PUBLIC AND PRIVATE GAS-WORKS.

Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.



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COOKERS, HOT-PLATES, STOVES, BATH-BOILERS, &C; SENT FREE.

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Manufacturers of

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IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

AND

IMPROVED DRY GAS-METERS;

STATION-METERS OF ALL SIZES, with PLANED JOINTS;

GOVERNORS, PRESSURE AND EXHAUST REGISTERS, TEST HOLDERS.

And all kinds of Experimental Gas Apparatus.

HYDRATED PURIFYING MATERIAL.

Samples on application.

MESSRS. SPENCE BROS., LIMITED,

Will be glad to supply the above on the most favourable terms, and to treat, by Purchase or Exchange, for Spent Oxide.

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ALSO PATENT DRY COPPERAS FOR EXTRACTING AMMONIA.

VICTORIA CHEMICAL WORKS, BRADFORD, NEAR MANCHESTER.

IMPROVED HYDRAULIC CRANES,

Effecting a great saving in the cost of discharging Coals from Vessels, Barges, &c. Several of these Cranes, with the necessary power, are now being erected at Beckton, Hull, and other Gas-Works.

HYDRAULIC APPARATUS for Lifting and Lowering Purifier-Covers.

Sixteen recently erected at Beckton, applied to Covers 30 feet square.

SULPHATE OF AMMONIA APPARATUS,

IN SUCCESSFUL OPERATION AT THE NEW WORKS OF THE NEWCASTLE AND GATESHEAD GAS COMPANY, AND IN COURSE OF ERECTION AT THE CARLISLE CORPORATION GAS-WORKS.

Special "REGULUS COCKS" manufactured to stand Acid.

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JOHN ABBOT & CO., LIMITED,

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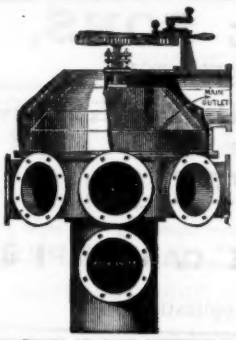
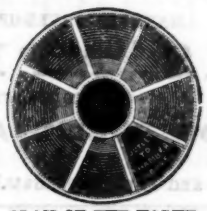
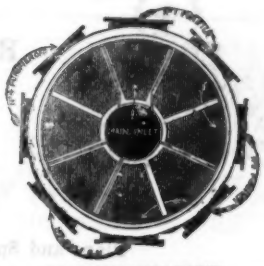


C. & W. WALKERS' PATENT CENTRE-VALVES.





ELEVATION OF THE CENTRE-VALVE. PLAN OF THE VALVE. PLAN OF THE BODY.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers on the system of three in action, and one out of action. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A considerable improvement and saving is effected in the cost of the connecting-pipes.

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GAS ENGINEERS,

WORKS: COMMERCIAL ROAD, EXETER,

INVITE THE ATTENTION OF GAS COMPANIES AND OTHERS FOR THE SUPPLY OF

EVERY DESCRIPTION OF GAS APPARATUS.

ENGINEERING DEPARTMENT.

NEW GAS-WORKS erected complete. Plans and Estimates furnished. MAINS, METERS, SERVICES, LAMPS, &c., adapted for Towns of any size. Gas Companies advised on Improvements, Extensions, and Alterations of Works.

GASHOLDERS AND TANKS.

RETORTS and RETORT-HOUSE FITTINGS, CONDENSERS, SCRUBBERS, ENGINES and EXHAUSTERS, PURIFIERS, STATION-METERS, GOVERNORS, VALVES, &c.

METER DEPARTMENT.

They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

GAS-FITTING DEPARTMENT.

An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS, MEDIÆVAL FITTINGS for CHURCHES, &c.

PATTERN-BOOKS and PRICE LISTS furnished.

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GAS ENGINEERING WORKS, COMMERCIAL ROAD, EXETER.

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BY
OXIDE OF IRON.
GAS PURIFICATION & CHEMICAL Co., LIMITED,
PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

JOHN WM. O'NEILL, Managing Director.

MESSRS. NEWTON, CHAMBERS, & CO.,
THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD,

MANUFACTURERS OF

IMPROVED CENTRE-VALVES,
PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.

WEST'S GAS IMPROVEMENT COMPANY.
LIMITED,

ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

CHARGING AND DRAWING GAS-RETORTS,
And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

The advantages attending its use are—

INCREASED VOLUME OF GAS PER TON.—INCREASED YIELD PER RETORT.—INCREASED BULK OF COKE FOR SALE.—REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.

A Pamphlet containing a description of the Machinery, and Copies of Reports on the working of the same, &c., will be forwarded on application to the MANAGING DIRECTOR, Maidstone. Communications may also be addressed to the Consulting Engineer, R. P. SPICE, Esq., M. Inst. C.E., 21, Parliament Street, London, S.W., or to the Engineer and Analyst, F. W. HARTLEY, Esq., A. Inst. C.E., 55, Millbank Street, London, S.W.

EDWARD COCKEY & SONS,
GAS ENGINEERS, FROME SELWOOD,
MANUFACTURERS OF ALL DESCRIPTIONS OF

APPARATUS CONNECTED WITH GAS-WORKS.
THE ORIGINAL PATENTEES AND MANUFACTURERS OF THE

DRY-FACED VALVES
FOR PURIFIERS, GASHOLDERS, BYE-PASS, AND OTHER ARRANGEMENTS REQUIRING VALVES IN GAS-WORKS.

The Faced Valves, as made by the Patentees, continue to give great satisfaction, and they are being used extensively by many of the best gas engineers of the day.

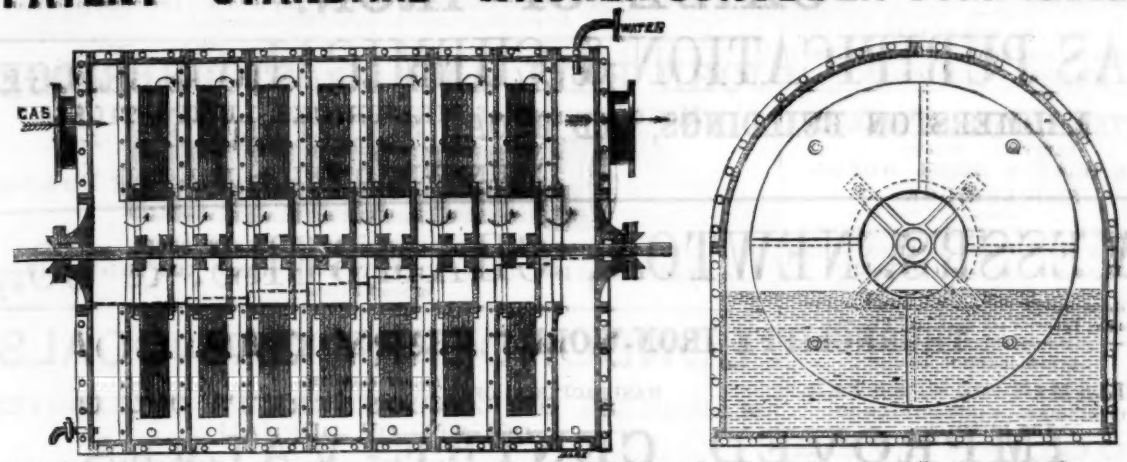
They are more easily repaired than any other kind of Valve in use, and can be re-ground in a few hours without removal, and made perfectly gas-tight.

References can be given to many Engineers of high standing, who will testify as to the favour in which they are held.

MANUFACTURERS ALSO OF SUPERIOR WOOD GRIDS FOR PURIFIERS, SCRUBBERS, &c.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

PATENT "STANDARD" WASHER-SCRUBBER COMPANY.



The Special Merits of this Washer are as follows:—That it is not necessary to reduce the temperature of the gas to 60°, or thereabouts, to make it effective; and that as no tar is retained in it, the illuminating power is not reduced as in Tower Scrubbers. That the distribution of the liquor is made with unerring regularity. That it occupies very small space, so that it can be, at little expense, effectually protected from extreme changes of the weather. That the considerable expense of Coke or Wood, or other Scrubbing Material, is entirely saved, and that the great nuisance and cost of from time to time replacing the Scrubbing Material is avoided. That, by the revolution of the discs, the quantity of water carried up by them, and tending continuously to fall, exposes a very large amount of fresh wetted surface to contact with the gas as it ascends. That it is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured. That it is much cheaper than any other Scrubber that will do the same amount of work effectually. That it is the only Washer suitable for purifying Gas from all its impurities by solution. That it works with a minimum of pressure. That it takes out every trace of Ammonia from the Gas in once traversing the machine, as well as a very large quantity of carbonic acid and sulphuretted hydrogen. That it requires very little outlay for foundations.

The following Testimonials show the opinion of eminent Engineers as to the capabilities of the Washer:—

Messrs. KIRKHAM, HULETT, and CHANDLER. *The Gaslight and Coke Company, York Road, King's Cross, Jan. 14, 1879.*

Gentlemen,—In reply to your inquiry, I am pleased to say the Washer which was put in action at this station in October last has quite fulfilled my expectations, as it confirms the experiments I made in May last with the smaller machine. Working at four revolutions per minute, it takes out every particle of Ammonia, while purifying more Gas than it was intended to do. I enclose particulars of a week's working during our heaviest make, by which you will see that it yields the full quantity and strength of liquor, and works with little pressure. I am therefore quite satisfied with the machine, and trust it may meet with the success it deserves.—I remain, &c., (Signed) JOHN CLARK, Engineer.

The following Table shows the results of the working of one of these Washers, lately erected to purify 60,000 feet of Gas per Hour, at the St. Pancras Station of The Gaslight and Coke Company:—

1879.	Nos. of the Divisions and Strength of Liquor in each.										Water used per Ton of Coals.	Gas Purified per Hour, Cubic Feet.	Ammonia on Outlet.	Temperatures.			Pressures.		Revolutions per Minute.
	1	2	3	4	5	6	7	8	9	10				Inlet.	Outlet.	Atmosphere.	Inlet, Inches.	Outlet, Inches.	
	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.									
January 7	11	9	7	5¼	3½	3	1⅞	1¼	½	0	10 Gallons.	59,000	Nil.	74°	66°	31°	25	23½	5
,, 8	9¾	7½	6	4½	3	2	1	¾	¼	0	10 ,,	78,000	Nil.	73°	61°	31°	28	26½	4½
,, 9	11	9	7	5	3¼	2½	1⅝	1	⅜	0	10 ,,	82,000	Nil.	74°	67°	33°	27½	25½	5
,, 10	10¾	8½	6¾	5	3¼	2½	1⅝	1	⅜	0	10 ,,	66,000	Nil.	76°	64°	28°	28½	27	5
,, 11	12½	10	7¾	5¾	4¼	3¼	1⅞	1¼	⅜	0	10 ,,	61,000	Nil.	78°	64°	27°	29½	25½	5
,, 12	11	8¾	6¾	—	—	—	1½	¾	⅜	0	10 ,,	39,000	Nil.	74°	64°	27°	26½	25½	5
,, 13	13	10¾	8¼	6	4¾	3¼	2	1¼	½	0	10 ,,	78,000	Nil.	73°	65°	42°	28	26	5

Messrs. KIRKHAM, HULETT, and CHANDLER. *Corporation of Birmingham, Gas Department, Saltley Works, May 23, 1879.*

Gentlemen,—I beg to enclose you a copy of the results of the tests which, by the kind permission of the Engineer, Mr. Clark, I made on the 6th of March last, of the working of one of your "Standard" Washers and Scrubbers at the St. Pancras Station of The Gaslight and Coke Company, and I am of opinion that, for an apparatus occupying so small a space, they are exceedingly satisfactory.—Yours truly, HENRY HACK, Engineer.

Working Results obtained from KIRKHAM, HULETT, *and* CHANDLER'S *Patent "Standard" Washer and Scrubber at the St. Pancras Station of The Gaslight and Coke Company, London, March 6, 1879.*

Gas passing, per Hour, Cubic Feet.	—	Impurities in Gas per 100 Cubic Feet.			Temperature.		Pressure in Inches.	Revolution of Apparatus per Minute.	—	No. of Divisions and Strength of Liquor.										Water Used during Experiment. Gallons.
		SH_2	CO_2.	Grains. NH_3.	Washer.	Air.				10	9	8	7	6	5	4	3	2	1	
64,000 {	Inlet	2·00	2·00	158·8	72	57	21	4½	Twaddel deg. at 60°	5·3	4·9	2·85	2·35	1·7	1·05	0·6	0·3	0·15	0·1	63
	Outlet	1·50	1·50	0·8	68	57	20		Acid, ounces	11·0	8·4	6·3	4·5	2·7	1·7	1·3	0·7	0·3	—	

Messrs. KIRKHAM and HERSEY. *The Leeds Corporation Gas-Works, Meadow Lane, Aug. 14, 1879.*

Gentlemen,—In reply to your inquiry of yesterday's date, I have pleasure in stating that the item appearing as income derivable from Ammonia in my estimate of revenue for current year is not an exaggeration. Our average income from Ammonia is 2s. 8d. per ton of coals carbonized, but at the works where your invention is in use we derive not less than 3s. per ton. Since the introduction of efficient Scrubbers at our works the greater yield of this product (now twice as valuable as coke to us) is such that the cost of Apparatus for its extraction can be wholly paid for out of from nine to twelve months gains. I am, Gentlemen, yours faithfully, (Signed) H. WOODALL, Engineer.

Messrs. KIRKHAM, HULETT, and CHANDLER. *Woolwich Equitable Gas Company, Engineers Office, Nov. 1, 1879.*

Gentlemen,—In answer to your inquiry respecting Washer erected here in September last, and which has been working here constantly since Oct. 1, I beg to say that it is working very satisfactorily. We sell over 24 gallons of 10 oz. liquor per ton of coal carbonized, and depend upon your Washer to extract all Ammonia, which it does satisfactorily, not leaving a trace of free Ammonia at the outlet. It takes little power to drive it, and the difference of pressure between inlet and outlet is scarcely noticeable, being less than half an inch. I consider it a very valuable machine, and have little doubt that it will pay for the outlay in a very short time. I shall be pleased to show it to any one that may be in want of such a machine, when they can see its capabilities themselves.—I am, Gentlemen, yours faithfully, (Signed) W. WHITE, Engineer.

Messrs. KIRKHAM and HERSEY. *Heywood Local Board Gas-Works, Hooley Bridge, Heywood, Dec. 1, 1879.*

Gentlemen,—In reply to your favour of the 28th ult., I beg to state that the Scrubber is at work, and doing well. I shall be glad to show it to any inquirers.—Yours truly, (Signed) EDWIN BUCKLEY, Engineer.

Messrs. KIRKHAM and HERSEY. *Phœnix Gaslight and Coke Company, Office, Greenwich, S.E., Dec. 19, 1879.*

Gentlemen,—In accordance with my promise that I would inform you as to the working of the "Standard" Washer erected by you here in June last, I now write to say that we are passing through it 100,000 cubic feet per hour (the quantity for which it is made) direct from the Condensers, "bye-passing" the whole of our Scrubbers, which, not being needed, have been standing still since the "Standard" Washer was put in use. It seems as though the Washer more effectually removed the Ammonia when taking the full quantity of gas than less; as, at the present time, at the sixth chamber (there being eleven in all) not a trace can be discovered either by turmeric or acid litmus paper. The difference in pressure between inlet and outlet is only ten-tenths of an inch. I need scarcely say, after the above, how perfectly satisfied I am. (Signed) P. J. WATES, Engineer.

For further particulars and testimonials, address Messrs.

KIRKHAM, HULETT, & CHANDLER, LIMITED, { 59 & 60, Palace Chambers, Bridge St. Westminster, London, S.W.

C. & W. WALKER'S
WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,
DONNINGTON, NEAR NEWPORT, SHROPSHIRE.
FINSBURY CIRCUS, LONDON.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE
FIRE CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

ESTABLISHED IN 1860.
BENJAMIN CARPENTER,
THE ORIGINAL MANUFACTURER OF THE IMPROVED
WOOD SIEVES
FOR
GAS PURIFIERS & SCRUBBERS.

PROVIDENCE WORKS,
22, HERMES STREET, PENTONVILLE ROAD,
LONDON, N.

The Dunston Engine Works Co.,
GATESHEAD-UPON-TYNE.
Are the Sole Manufacturers of
Archer's Patent Hoists,
ALSO OF
Archer's Patent Stone Breaker,
AND OF
Archer's Patent Ore Crusher & Pulveriser,
The last-named Machine (without the Pulveriser) makes the best and most durable Coke Breaker.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

ASBESTOS,
INDESTRUCTIBLE FUEL FOR GAS-FIRES.

REDUCTION IN PRICES.

Apply for Price List and Samples to the Original Manufacturer,

THOS. REYNOLDS,
100, ASTON ROAD, BIRMINGHAM.

Gold Medal Awarded, Paris Exhibition, 1878.

THOMAS TURTON AND SONS,
SHEAF AND SPRING WORKS,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY FOR ENGINEERS,
STEEL OF ALL DESCRIPTIONS,
SCREW STOCKS, TAPS, AND DIES, SPANNERS, RATCHET BRACES, LIFTING-JACKS, ANVILS, VICES,
AND ENGINEERS TOOLS GENERALLY.
LONDON OFFICE:
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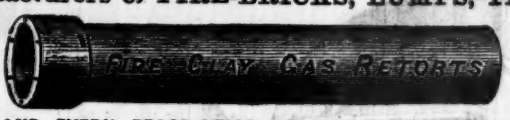
EDWARD BROOKE AND SONS,
FIELDHOUSE FIRE-CLAY WORKS, HUDDERSFIELD,
MANUFACTURERS OF
GAS-RETORTS, FIRE-BRICKS, &c.,
Which have been extensively used for 30 years in the construction of Glass Furnaces, where the heat is five times greater than in Gas Ovens; superior to any Retorts or Fire-bricks in the market for standing intense heats, and not contracting.

JOHN HALL AND CO., STOURBRIDGE,
Manufacturers of FIRE-BRICKS, LUMPS, TILES,



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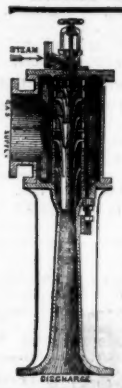

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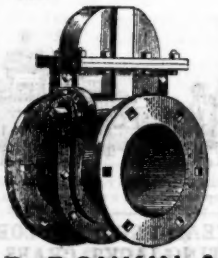

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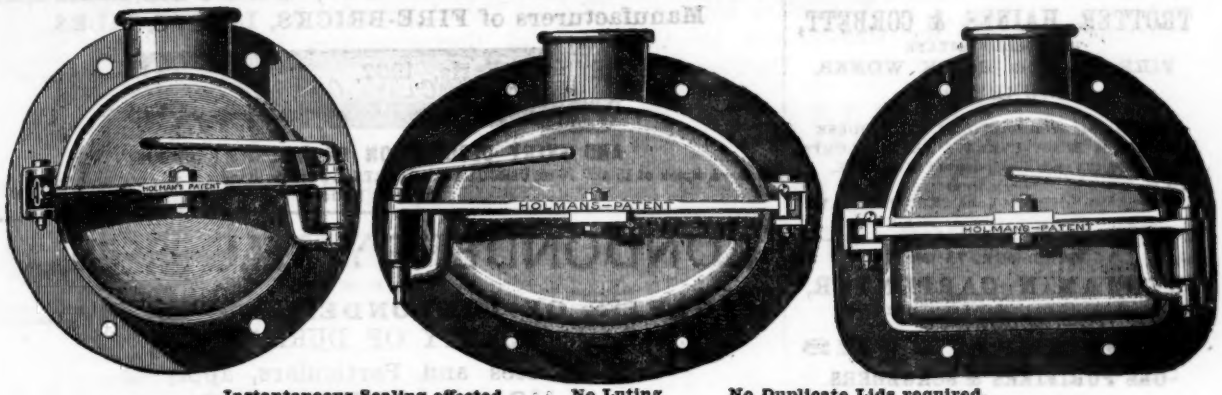

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TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

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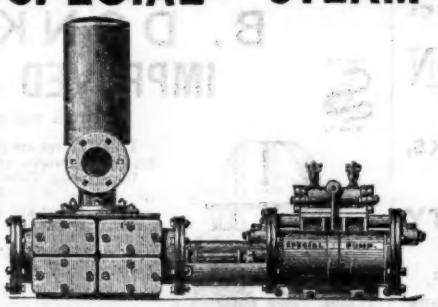
5*	2½	12	1,250*	21
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



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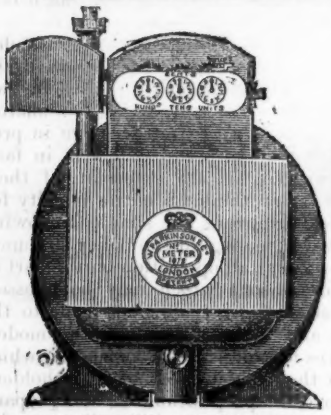

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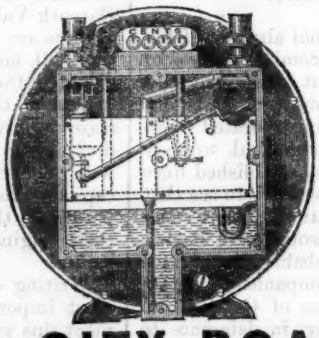

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TO CORRESPONDENTS.

H. E. C.; A. A. L.—*Thanks for letters received.*

J. C.—*Your letter is noticed below.*

A. B.—*No date has yet been fixed for the issue of Vol. III of "King's Treatise on Coal Gas;" but several months will elapse before it can be completed. Due notice of its publication will, however, be given in our advertising columns.*

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 13, 1880.

Circular to Gas Companies.

IN the present number we commence our usual abstract of the Gas Bills which will be promoted in the coming session of Parliament. To-day we only give those put forward by Gas Companies in order to obtain incorporation with statutory authority, and those promoted by already incorporated Companies to obtain more extended powers. In general, we may say that, in these Bills, what we may call the established lines of legislation have been followed. We are sorry to see that only two Companies apply for incorporation. There may have been special reason for this, for the dissolution of Parliament, which a short time since seemed probable, would have rendered nugatory the exertions of any Companies to obtain legislative sanction to their Bills. In one of the Bills to which we are now referring, the Company, in deference to Standing Orders, have proposed to adopt auction clauses and the sliding scale; in the other case, the sliding scale is proposed, but no auction clauses. When, however, the latter Bill is before the Chairman of Committees in the House of Commons, the defect, if it be a defect, may be remedied. Similarly, in the majority of the Bills, the Companies who have not yet been subjected to recent legislation have offered to submit to the regulations required by the recent Standing Orders proposed by Earl Redesdale and Mr. Raikes.

We are pleased to observe that every year the number of Companies who have asked for power to supply fittings, and more especially apparatus for the consumption of gas for other than illuminating purposes, increases. We look forward to the time when a gas-stove for cooking and heating will be considered part of the common furniture of every householder. We know of no instance in which such apparatus, having once been adopted, has been given up. The London Company again come forward with their Bill, which we hope will this year meet with the success that it merits. The consumption of gas in the Metropolis would be enormously increased by the use of these appliances. There is room, too, for a large development of the use of gas for the production of motive force. There are so many cases in which the employment of mechanical power is desirable, but in which the use of a steam-engine is inadmissible, that we feel satisfied the gas-engine requires only to be better known to be thoroughly appreciated. Many people complain of the first charge for the engine; but as a larger demand for them springs up, the cost of production will decrease, and they will doubtless be sold at a much lower rate. In the sale of fittings for the use of gas for lighting purposes care and caution will have to be exercised; and Gas Companies must avoid undertaking the fixing of these apparatuses, as this might land them in serious responsibilities. The services of the gas-fitter proper cannot be dispensed with. The *rôle* of the Company is, after the consumer has made choice of his fittings and decided on the number of lights he will employ, to advise on the size of the pipes and meter required to furnish the quantity of gas needed, and the best burners to use. The superintendence of the Company should commence at the service-pipe, and extend over the house. Such superintendence, intelligently exercised, would prevent nine-tenths of the complaints which now worry Gas Companies. The thick fog which prevailed during the past week severely taxed the energies of gas managers, and complaints have been made as to the quality and quantity of the gas supplied during the periods of darkness. A part of these may perhaps be ascribed to the use of fittings inadequate to carry and consume to advantage the gas, necessarily sent out at a lower pressure than usual.

Among the Bills to be promoted for giving extended powers to Gas Companies, we may particularize that of the Liverpool United Company, who, desirous of raising further money, have elected to borrow in place of issuing new shares. The additional sum they require is not, indeed, large in proportion to the sum they have already raised. It is, in fact, only £70,000, which is wanted for the extension of their Linacre works. It is, we rather think, an entire novelty for a Gas Company to go to Parliament for simple borrowing powers. In this case, however, we regard the policy as sound. It will, in the first place, prevent all opposition on the part of the Corporation, who, for reasons which may be guessed, would strongly object to see any great additions made to the capital of the Company; and then, in any case, the modest proposals of this Bill saves the infliction of legislation which we regard as inimical to the true interest of Shareholders. For these reasons we regard the proposition of the Company with much favour, and have no doubt the Bill will meet with the success it deserves.

The idea of the advantages of amalgamation seems to be spreading into the country, and we notice a Bill which is intended to combine into one undertaking the Dartford, Darenth Vale, and Greenhithe Gas Companies. These undertakings are favourably situated for union, and their combination will, no doubt, prove highly advantageous to the amalgamated Company. When the union is effected, the share capital of the United Company will be divided into three classes, entitled respectively to ten, seven, and five per cent. dividends. The original capital of the Dartford Company will take ten per cent.; while the additional capital, and the capital of the Darenth Vale Company will be entitled to seven per cent.; the Greenhithe Company having seven per cent. on their original capital, and five per cent. on their additional capital.

Writing of amalgamation necessarily brings us to the two most important Bills set down for presentation to Parliament this year—those of the Phœnix and the South Metropolitan Companies. It is hinted in another place that it is doubtful how far the former will be proceeded with. If the

scheme for the amalgamation of the Companies be sanctioned by the Privy Council, the former will most certainly be dropped. Once merged together, the two Companies will proceed under the guidance of established legislation. Supposing the scheme should not be approved, there are certain things that would require alteration; but in many respects it might pass unchallenged; for, as a fact, it does little more than reproduce the provisions of the Chartered Company's Act of 1876, so far as the action of the Referees, the modes of testing, and the method of levying forfeitures for defaults are concerned. There are some points in the Bill which, if there was any probability of its coming before Parliament, we should notice; but as we regard it as already dead, we do not consider further reference necessary.

We turn for a moment to the Bill promoted by the South Metropolitan Company, which is comparatively a simple measure. The Company being already subject to all the most recent Metropolitan gas legislation, there is no necessity to promote such an elaborate measure as the Phœnix Company have done. The Company ask for power to raise a million of money, and half that amount by borrowing. This is done in deference to the commands of the Board of Trade and the wishes of the Metropolitan Authorities, under the impression that consumers are largely benefited by the process. There is, no doubt, much to be said in favour of this view of the case. Companies can borrow at a low rate of interest, and the difference between four and seven per cent. is considerable.

We hear that all the holders of five per cent. stock in the Phœnix Company are not satisfied with the proposed conversion of it into ordinary ten per cent. stock. We cannot deny that they may be a little, but a very little, prejudiced by the change. The five per cent. was a sort of guarantee stock, the holders being entitled to a full dividend until the other shares came down to a common level. Under the re-arrangement, however, the converted stock will share in the benefits of the sliding scale, which we hope and believe will prove to their advantage. In any case, it must be borne in mind that the conversion was not the work of the Directors of the Company, but was insisted upon by the Board of Trade, who were determined that all the capital of the amalgamating Companies should be brought under the action of the sliding scale.

Grumbling is the privilege of all Englishmen. The Reading Gas Company, as our readers will see in another column, are promoting a Bill to enable them to raise further capital, purchase land, and erect new works. The Bill is by no means an extravagant measure. The amount of new capital asked for may seem large, but it is perfectly clear that it does not go beyond the necessities of the case, considering the very rapid growth of the town. It is not wise for a Gas Company to go to Parliament too frequently, the proceedings being expensive, and the results not always satisfactory. Some members of the Reading Corporation think a Gas Company cannot promote Bills too often. They see in the process a means of putting on the screw. We do not anticipate, however, that the Corporation will in this instance offer very strenuous opposition to the measure promoted by the Company. They would like to have fifteen-candle gas instead of fourteen, with power to raise the standard according to their own will and pleasure, it being understood that they are quite willing to pay for an increase of light. The price now charged for gas at Reading is considerably below what the Company's present Act allows, and it was naïvely suggested in the Council that the maximum price might be reduced to something like that now charged. In view of certain possibilities and even probabilities, we cannot recommend the Gas Company to accede to the suggestion. Let them sell gas as cheaply as they can, but at the same time keep a margin for a rise of price if disastrous times should come again. We are bound to say, however, that the Town Council have behaved very well in the matter. They are evidently on good terms with the Company; and they ought to be, for they have been admirably served by them for a number of years. We sincerely hope that nothing will happen to disturb the amicable relations at present existing. As to the idea of purchase, that, we are glad to see, is not entertained; for, without any reference to the electric light "luming," as one of the Councillors said, in the distance, we are quite certain that the margin of profit which the Corporation could make after borrowing money at four or four and a half per cent. would be very small for many years to come.

The works of the United General Gas Company at Limerick have at last been handed over to the Corporation. The transfer took place on the 1st inst., when the purchase-money of £28,000 was paid. We confess we did not expect the Corporation would be able to raise the money, but their circumstances have doubtlessly of late improved. Limerick hardly requires two gas-works, and we understand it is proposed to combine the original works of the Corporation with those they have just acquired. One will probably be discontinued, which will render necessary a concentration of the manufacturing plant, and an extensive re-arrangement of the mains. To guide them in making these alterations, the Corporation have obtained the services of perhaps the ablest adviser they could consult—Mr. T. Newbigging.

The annual general meeting of the Bilston Gas Company was held on the 5th inst., and the proceedings revealed a tolerably prosperous state of affairs. The profits were not so large as in the previous twelve months, mainly on account of a reduction in the price of gas at the beginning of last year, and a bad sale of coke. Trade is, however, rapidly improving in Staffordshire, and we have no doubt that next year's accounts will show more favourable results. The dividend for the past year was eight per cent.

The rage for the purchase of gas-works by local authorities has extended to Gainsborough, where the small local Gas Company have been threatened. A number of members of the Board have, however, been scared by the electric light, and so propose for the time not to go on with an arrangement into which they could have entered for the purchase of the works for £42,000. The Company met them in a very liberal spirit, and kindly offered to take back the works, and return the purchase-money, if in the course of twelve months the electric light made any progress towards coming into general use.

The report of the Chief Gas Examiner for the Metropolis shows once more how well the Companies keep up the quality of their gas. In only two cases has any deficiency of illuminating power been observed, during the quarter, at the eleven testing-places in the Metropolis. On the contrary, large excesses were frequently noticed, and the average quality has been far above the standard prescribed by Parliament. As regards sulphur impurity, we may mention that the standard fixed by the Referees was well maintained. Ammonia, of course, hardly figures in the report, it being in some cases altogether absent from the gas.

Water and Sanitary Notes.

We have not yet received any specific information as to the progress of the negotiations between the Government and the Metropolitan Water Companies, but rumour has it that considerable advance has been made towards the settlement of the question of purchase. That this is probable seems to be proved by the fact that a good deal of speculation has recently taken place, and that the shares of all the Companies have risen in price. Stock Exchange men are generally very well informed. The most recent view put forward as to the terms which the Companies will ultimately obtain is that the Government will offer in exchange for the existing stocks of the Companies an equivalent in Government stocks at a price to be decided upon. Setting aside recent speculative dealings, there can be little difficulty in assessing the present value in the market of the stock of the water undertakings. But this does not include their whole value. In every case of compulsory purchase, recognition has been made of the principle of paying for prospective value. All the London water undertakings are rapidly improving concerns. They may make from five to seven per cent. only to-day; but, if let alone, from eight to ten per cent. might be paid in a few years. This is a matter which we hope the Directors of the Companies who have had dealings with the Government have taken fully into consideration, for it is a point of vital importance to the interest of the Shareholders. It is rumoured that five of the Companies have now acceded to the terms offered by the Government; but, at the same time, it is thoroughly understood, in influential circles, that there is still room for opposition. The Shareholders of no one Company have as yet been called together to express their opinion on any terms of purchase, which, therefore, cannot be considered as at all arranged. How much of the negotiations is upon paper signed and sealed, and how much consists of a mere verbal understanding between the Agents of the Government and the Directors of the Water Companies, is to us unknown. The whole affair seems at present *in nubibus*, and we must wait for further information.

In the meantime, the great question still remains—What will the Government do with the water undertakings if they should become possessed of them? There is, so far as we can see, but little speculation on this point. There is an idea that the works will be handed over to the management of what

has in some cases, by a figure of speech, been called a Trust. The formation of a body from the most accomplished Directors of the existing Water Companies would, we believe, be hailed with satisfaction by most ratepayers and consumers; but we think there are others who would prefer to see the undertakings under certain *doctrinaire* C.B.'s and engineering quacks. Against the employment of these we shall strongly set our face. Give us honest and capable men, experienced in the management of water undertakings, and we shall be perfectly satisfied that all will go well. In the service of the Water Companies there are Engineers and Secretaries of much eminence in their profession, and from these it would be easy to pick out men who could ably carry on the work of the undertakings. A selection from the Directors of the present Companies would constitute a Board eminently qualified to superintend the Metropolitan Water Supply. Such men, we may say, any Trust must of necessity employ, and it is well for them that they have the immediate advantages of their services. Much of this is, of course, in anticipation. The purchase of the Metropolitan water-works by the Government is still unsettled. We have hinted that influential opposition may possibly arise, and this will certainly come about if the righteous demands of the Shareholders are not satisfied. Messrs. Beal and Watherston may be disappointed, but we can promise them that all negotiations in the matter will fall through unless the just demands of the Proprietors are complied with.

We have repeatedly said that the plans of the Liverpool Corporation, for taking a supply of water from the Vyrnwy and head waters of the Severn, would have to encounter strenuous opposition from towns and cities down the stream. We think, however, we discern evidences that the threatened opposition is fast collapsing. Worcester, as the seat of the Severn Commissioners, might naturally be expected to take the lead in the opposition, and they have done so; but their efforts to stir up strife, so far as we can gather from accounts received, have failed. The Corporation have communicated with Shrewsbury, Bridgenorth, Bewdley, Tewkesbury, Cheltenham, and Gloucester; but no reply has, we believe, yet been received from the Authorities at these towns. Thus, we think, we have very fair reason for assuming that what was expected to be the main opposition to the Liverpool scheme has fallen through. All arrangements for the supply of compensation water at the top of the stream are, we understand, satisfied. The Liverpool Corporation will thus have no difficulty in proving to the Committee of the House of Commons that, while providing for the necessities of their own borough, they have not been unmindful of the interests of those who abstract their water lower down the Severn. In the course of the next week or two we shall have the Water Bill of the Liverpool Corporation before us, with much more information as to the intentions of the cities and local boards on the banks of the river; and, when possessed of this information, we shall probably be enabled to express a more decided opinion as to the prospects of the Corporation Bill.

The Lower Thames Valley Main Sewerage Board have, as our readers have already been informed, applied to the Local Government Board for a Provisional Order to enable them to carry out the scheme which was so promptly rejected by the House of Commons last session. That scheme, it will be remembered, was thrown out without any inquiry. If an inquisition had taken place, we do not know that the result would have been at all different; but, on moral and political grounds, we have a strong objection to the rejection, without inquiry, of any measure submitted to Parliament. We desire to see the scheme fairly considered by a constituted authority competent to decide on the merits of any plan. How far one "Authority" may be competent to decide on a complicated scheme such as is proposed by the Main Sewerage Board, we shall not undertake to say. Recently an engineer of much eminence, sitting as judge, refused to take evidence as to opinions, and would listen only to details of what were considered facts. We believe he was promptly snubbed by a Court of Justice; but our point is that in an inquiry relating to the scheme now propounded, opinions —always supposing them to come from competent authorities—should be listened to as well as the facts on which they are supposed to be founded. We regard, then, as of the utmost importance a searching inquiry, under an Inspector of the Local Government Board, before a Provisional Order is granted. Curiously enough, a deputation from the owners and occupiers in the immediate neighbourhood of the locality in which the Board propose to establish their sewage farm has been to Mr. Sclater-Booth to protest against any inquiry being held. They wish the Provisional Order to be refused, just as the Bill was thrown out in the House of Commons last year. This, however, cannot be allowed, and an inquiry, it is admitted by the Local Government Board, must be held. Not to hold one, would be unprecedented, and might defeat the object for which the Board was expressly constituted. It must be remembered that if the Board succeed in obtaining a Provisional Order, the Order must eventually come before Parliament for revision and confirmation, and without such evidence as might be taken before the Inspector it would run the risk of prompt rejection. Backed by such evidence, it would, in the absence of factious and interested opposition, be sure to succeed.

Captain Shaw's report on the fires which occurred in the Metropolis during the year 1879 was laid before the Metropolitan Board of Works at their last meeting. It states that 1718 fires occurred, only a small proportion of which were of any consequence. The number is larger than in the preceding year, but perhaps not more numerous than might have been anticipated. What concerns us most, however, is the state of the water arrangements for the extinguishing of these fires; and here we may express a decided opinion that the Water Companies did their duty well. In only nine cases out of the 1718 was there a short supply of water. (We ought, by the way, to have been told where these short supplies occurred; for, as it stands in the report, imputation lies upon all the Companies.) In thirty-three cases a late attendance of turncocks is reported, and in eighteen Captain Shaw reports that there was no attendance at all. Seeing the present arrangements, to which the Metropolitan Board have tacitly given their assent by refusing to allow turncocks to reside in the Fire Brigade stations, we can only be astonished that fewer failures of attendance are not reported. It may be, however, that in another two years we shall have to report on the success or non-success of a Water Trust in assisting at the extinction of fires, and we shall be greatly astonished if any greater success attend their efforts than is at present achieved by the Water Companies. We are sorry to see that Captain Shaw makes no remarks upon the success of the hydrant system, which now obtains all over the City, and in a good portion of the East and South-east of London.

FUEL.*

Mr. Robert Galloway, under the title of "A Treatise on Fuel," has published a revised and extended report of a series of lectures on fuel, delivered by him in the Royal College of Science, Dublin. The book is not quite so exhaustive as its title would lead one to expect, but still it contains a considerable amount of information on the subject. The various chapters, too, are not arranged in such strict logical sequence as they might be, and the whole work is rather fragmentary in its character. It abounds in tables, and is moderately sprinkled with formulæ, in reference to which we cannot avoid drawing attention to the confusion wrought through the liberty exercised by every modern scientific writer of adopting at pleasure the metric or common system of weights and measures, and of referring to the Centigrade or Fahrenheit thermometric scale. Mr. Galloway is a rather striking example of this, for he gives his examples of calculations of calorific power and intensity in metric measures, and immediately proceeds to describe in ordinary English measures and scales the apparatus and methods of manipulation by which the data he uses are experimentally obtained. The employment of different standards is immaterial when ratios and constants have to be determined, but the adoption of two conflicting systems in the same book is very troublesome, if not perplexing.

As a manual for use with the various calorimeters, pyrometers, and other analytical apparatus, which are fully illustrated and described in its pages, this little work would doubtless be most useful, for the descriptions of the *modus operandi* in all cases are eminently practical and complete, bearing evidence of having been compiled from actual experience. Sugg's apparatus for testing gas coal is praised for its close approximation to the conditions of ordinary manufacture, and its use is recommended in preference to the method of proximate analysis, which, as the Author says, is the next best means of valuing these varieties of coal. The problems presented by the composition of coal, with respect to the precise conditions under which the elements carbon, hydrogen, oxygen, and nitrogen exist in the combined state, and the uncertain nature of the changes which occur when they are dissociated, are mentioned, and our ignorance of the true state of things is fairly acknowledged, but no hint is given as to the means of arriving at a better understanding. Simple means are shown by which the intensity as well as the power of combustibles may be ascertained and compared, and the reasons why the theoretical power of fuel is never obtained in practice are stated with sufficient clearness.

A complete description, with illustrations, is given of Siemens's Gas Producer and Regenerative Furnace as applied to the manufacture of iron.

On the whole we may recommend the work as useful to the large class of persons whose employment of coal gives them an interest in the experimental treatment of this combustible, to which so large a portion of its contents refers.

* "A Treatise on Fuel, Scientific and Practical." By Robert Galloway, M.R.I.A., F.C.S., &c. London: Trübner and Co. 1880.

THE EDISON ELECTRIC LIGHT.

The Edison tinder-box is hailed by the *New York Herald* as "the perfected lamp." Mr. W. H. Preece, Electrician to the General Post Office, ridicules it. Professor Proctor admires it. The Count du Moncel, writing to Dr. Cornelius Herz, expresses his astonishment at the excitement created by so dubious an invention. The *Daily News*, ever ready to prophesy against the Gas Companies, is at a loss what to make of this latest device. The *Standard* finds a parallel within the limits of the agricultural interest by comparing the new lamp to "Hodge's scooped turnip with a candle inside." *The Times*, which bade the world long ago "worship the "rising sun of electricity," is now a little more cautious in its enthusiasm, contenting itself in the main by quoting the commendations and conclusions of its correspondent who had the felicity of eating his supper at Menlo Park by the light of Mr. Edison's lamp. In the American press, "Mr. "Electrician Sawyer," after giving a bold challenge to Mr. Edison to bring forth proof on certain points, finishes by saying, "And I further allege that all Mr. Edison's state-"ments are erroneous." The statements thus challenged have reference to the particular dynamo-electric machine which Mr. Edison has invented, as well as the lamp itself. Mr. Edison has also invented a meter, so that everything is complete. The current is subdivided to any extent, and the amount of light can be regulated as easily as the flame of a gas-burner. The lamp costs a shilling, and the light can be furnished at a rate equivalent to gas at tenpence, or less, for ten thousand feet—that is to say, a penny a thousand, or, as *The Times* puts it, forty times cheaper than gas. In the United States the Edison light would thus be something like a hundred times cheaper than gas; so that if Mr. Edison has really accomplished what is alleged, there ought to be an end to gas altogether. For the present, the most marked effect appears to consist in the inflation of the shares of the Edison Electric Light Company, which are quoted at from twenty to thirty times their par value.

Experience teaches. We have had experience of Mr. Edison, and it teaches us to doubt him. He is a sanguine man, and possibly a tool in the hands of others. He must be invaluable to speculators on "'Change." If for some reason the market for gas shares has to be brought down, nothing can answer the purpose better than to trumpet forth some fresh discovery by Mr. Edison. This last invention is perfection itself. It is difficult to see how anything can be cheaper, or better, or more facile. There is positively nothing wanting. Forty times cheaper than gas, and quite as convenient in use, with all sorts of advantages which gas cannot pretend to offer, the new system must carry all before it. Henceforth, instead of the usual vulgar proverb, we shall employ the fair comparison, "Cheap as light." Let us imagine coal at tenpence a ton, or wax candles incomparably cheaper than the present rushlights; let us think of flour at a little more than a farthing a gallon, or Bass's bottled ale at three-halfpence per dozen imperial pints; let us travel forty miles by rail for a penny, and let us outdo in this way the wildest dream of Jack Cade—we shall then get an idea of how cheaply henceforth we are to enjoy the benefit of "bright, clear, mellow, regular, and un-"flickering" light. After conjuring up this brilliant prospect, to tell us that "there is a good future before the Gas Com-"panies" is enough to prove that those who make such statements either mean only half what they say, or do not know what they are talking about. If Mr. Edison has accomplished all that is claimed on his behalf, he has set on foot an economic revolution such as the world has never yet seen. He has, in effect as well as in appearance, made platinum as cheap as paper. It is perfectly consistent with all this wild assertion, to be told of "the wizard's by-play," by which he made "a veritable Job" almost well of his sores and rheumatics in the space of a week. Another piece of by-play at Menlo Park is extracting gold out of the waste sand of the "diggings," so that valueless "tailings" yield from forty to sixty pounds sterling of gold per ton. The *elixir vitæ* and the philosopher's stone are evidently pretty close to Menlo Park.

When outrageous promises are made, there are many people who conceive that, a liberal discount being allowed for exaggeration, there will be found a large residuum of truth. The idea thus very commonly entertained is, as a rule, fallacious. Truth does not commonly adopt the garb of error. There is force in the old proverb, "Too good to be true." The prospect of a splendid fortune is generally a delusion, while the expectation of a modest return may be verified with a little added to it. But we will allow Mr. Edison to be his own judge. We know what he has said in the past, or what he has allowed to be said in his name. Wonderful tidings burst upon the world a year and more ago. There was the platinum or platinum-iridium lamp, with its gorgeous glow of "mellow" light. In the blaze of this new luminary, gas shares in England fell alarmingly. Now we are told that, after Mr. Edison had been working at platinum and iridium for some months, and getting a "beautiful" light, he discovered that these substances "as now known in commerce are useless for giving "light by incandescence." This is what electricians knew long before Mr. Edison found it out. Unfortunately, the holders of gas shares generally know as little about the electric properties of platinum and iridium as Mr. Edison did at the beginning of his experiments; otherwise they would not have been frightened, as many of them were, into making heavy sacrifices of valuable property.

The tale recited in the *New York Herald* of the 21st ult. as to Mr. Edison's "fifteen months of toil" and his "tireless "experiments with lamps, burners, and generators," is an elaborate apology for the delusion which Mr. Edison has unwittingly practised upon the world. Amid an imposing array of dainty diagrams, we are told of "The First "Lamp," "The Second Platinum Lamp," "The Bobbin "Lamp," "The First Platinum Vacuum Lamp," "The Paper "Light," and at last "The Perfected Lamp." We read of "brilliant results," followed by "a fresh departure." There are "many alterations and improvements," and then it is recorded—"but eventually the apparatus was placed in the "category of non-successes." "Non-success," we presume, is much the same as failure, and what guarantee have we that the "paper light" will not go the same road? As for the generator, Mr. Edison made one long ago which was to excel all predecessors, and now no one condemns it more than himself. We have only to wait a while, and Mr. Edison becomes his own severest critic. But while he is perpetually "rounding" on himself, he always has "the next article" ready wherewith to amuse the public. That he is sincere in his belief from time to time need not be questioned. No man would work so indefatigably unless he had faith in himself. But after wading through the history which covers more than a page of the *New York Herald*, we find that Mr. Edison began to invent before he knew what had been the inventions and discoveries of other men. He has gone over the ground which has been trodden before, and even now he is scarcely abreast of the age in the domain of electric lighting. His "per-"fected lamp" is but an example of incandescent carbon *in vacuo*. The fact that his carbon is made out of baked paper, constitutes a modification of a very subordinate character. Carbon rendered incandescent in a vacuum is nothing new, and the fragility of the carbon which is to emit the light in the Edison lamp threatens to render the apparatus impracticable in ordinary use. Just as Mr. Edison found platinum, iridium, and osmium, singly or alloyed, to fail under a continuous test, so we may look for failure again, or what is designated "a "fresh departure." Mr. Edison is rich in expedients, and fertile in resource. Moreover, he has a wide field before him, where he may ring the changes to the end of time, especially as he can imitate the example of the fashionable *modistes*, who, when the new fashions wear out, fall back on the old.

A long article in *The Times* of yesterday, from "A Corre-"spondent" at New York, states, among other things, that, concerning the apparent success of the new lamp, "the most "astonished man is certainly Mr. Edison himself." Further evidence is afforded in this communication of the groundless nature of those announcements which caused so much excitement in the autumn of 1878. The account now given of Mr. Edison's efforts agrees exactly with the criticism which we offered at the time. Concerning all that was done during an entire year subsequent to the first outburst of enthusiasm, we now read: "The experts foresaw failure long before "Edison did; and, finally, Edison himself reluctantly "came to the conclusion last fall that he was on the "wrong track entirely." It is added: "The man wore him-"self out very nearly, and the disappointment almost sent "him to his grave." It was not until "about two months "ago" that Mr. Edison "resolved to test the utility of "carbon." Accordingly, the present lamp is about nine weeks old from the date of its inception, and the epoch of the paper horseshoe is even as recent as the beginning of last month. It was not until "about two weeks" prior to Dec. 30 (the date of the letter from New York) that "experi-"ments began" with the new lamp. At that period, we are told, "a whole crop of new questions sprang into view." All these, it is intimated, have been "promptly solved" by actual experiment, and the working staff at Menlo Park is described as being in a state of intense excitement. "Every man," it is said, "from Mr. Edison down, was first astounded, and then "exhilarated." How much they are astonished may be

inferred from the statement, "They have had so many "failures that they can now scarcely believe their senses."

It is satisfactory to find that while the Edisonian staff was thus in a state of semi-delirium, the holders of American gas shares continued sane. The New York correspondent says: "The invention of this new lamp has not produced any very "striking effect in regard to gas stocks here yet." Of course such a sensation as we find among the believers in Mr. Edison cannot fail to affect other people in some degree. How readily the votaries of the electric light are stimulated into extravagant expectations is shown by the enormous premiums now demanded for shares in the Edison Electric Lighting Company. The hundred dollar stock fell to twenty dollars last summer, and now it is difficult to set a limit to the prices which some holders are demanding. So far as the facts of the case are concerned, Mr. Edison is adding lamp to lamp at Menlo Park, and intends to go on until he has one hundred and fifty of them burning, "the object being to develop "defects." "A few weeks from now," says the writer in *The Times*, "Mr. Edison will be able to formulate a clear "opinion about the merits of the invention." There is something commendably modest in the opinion now attributed to the man of many inventions respecting his latest lamp. Holding in suspense his final opinion, "he believes that the new "lamp can be distributed over a large area, and houses lighted "therewith, for the same price as now paid for gas, possibly "less; but of the latter he is not certain." If the prospect of thus underselling American gas is only "possible," and not "certain," there is at present very little to alarm the holders of gas shares in England.

We cannot set bounds to science. But science is not all on the side of the electricians. Gas has its latent capabilities as well as electricity. The electric light has been hovering on the verge of the horizon for a long time, and is still far from the meridian. If the improvement of gas and gas lighting be pursued with as much skill and ardour as the development of the electric light, we shall probably see very marked progress in the application of gas both to lighting and heating. Assuredly the introduction of gas as a means of artificial illumination was never accompanied by such wild figments as have heralded the approach of the electric light. In the early days of gas, the romance was all against it, and imagination was excited in opposition to the new comer. Fancy was found contrary to fact on that occasion, and so it may be now, when we see it exercised still in opposition to gas, by giving extraordinary value to the changing phases of the electric light. At all events, we may leave Mr. Edison to pursue his experiments, if he chooses to continue them, so that he may make his "perfected lamp" more perfect still. If we wish to know the real progress of the electric light, we would rather look away from Menlo Park, and fix our attention on the inventions of Siemens, Jablochkoff, and Brush. If gas is safe in the presence of these, it is not likely to suffer from the achievements of Mr. Edison.

THE GAS-METER DISPUTE AT OVER DARWEN.—It will be remembered that in November last a dispute arose between the Corporations of Blackburn and Over Darwen, in consequence of the seizure by the former Corporation of a number of meters under circumstances which have already been reported in the JOURNAL, the dispute being afterwards settled on the Corporation of Blackburn undertaking to offer an apology for their conduct, and pay the sum of £275. At the meeting of the Darwen Town Council on Monday, the 5th inst., the following letter from the Town Clerk of Blackburn was read:—"Dear Sir,—Enclosed I send you cheque for £275 in settlement of dispute, and I am instructed at the same time to express, on behalf of the Corporation of Blackburn, their great regret for the proceedings which they took in the matter."

THE WATER SUPPLY OF FROME.—At the monthly meeting of the Frome Local Board, on Friday, the 2nd inst., Mr. Tomlison, the Engineer of the water-works, was present, and made a statement relative to the progress of the works. The chief point he wished to refer to was the deepening of the well, and the consequent increase in the quantity of water. Last year the supply was 300 gallons per minute. The deepening of the well to the extent of 4 feet had resulted in an increase of 268 gallons per minute, making 568 gallons, or 817,920 gallons in the 24 hours. The maximum supply for a population of 10,000 was 250,000 gallons in the 24 hours, or one-third of the supply at the disposal of the Board. The testing had been proceeded with since the 6th of November. The steam-engines would soon be fixed, and he thought they would be ready for pumping into the reservoir by the 1st of February.

PRESENTATION TO MR. H. ROBUS.—On the evening of Thursday, the 1st inst., the members of the Crystal Palace District Gas Company's Workmen's Club presented a very handsome marble clock to Mr. H. Robus, who for the last 14 years has held the post of foreman at the works. The following, which is the inscription on the gift itself, fully describes the object of the presentation and what led to it:—"Presented by the members of the Crystal Palace District Gas Company's Workmen's Club to Mr. H. Robus, foreman of the works, as a tribute of gratitude for his generosity and perseverance in founding and assisting them to support a Provident Club for sickness, and his readiness at all times to assist the widows and orphans of the workmen. Jan. 1, 1880." The clock was presented to Mr. Robus, in the name and in the presence of about 200 of the day workmen, by Mr. C. Gandon, the Engineer, and a very suitable reply was made by Mr. Robus.

GAS BILLS FOR 1880.

THERE are eighteen measures to be promoted by Gas Companies in the coming session of Parliament. Of these, two only are to confer powers of incorporation on Companies hitherto without statutory authority.

The *Ackworth, Featherstone, Purston, and Sharlston Bill* is to incorporate a Company supplying gas to the places above named, and to others in the vicinity. The Company were formed in 1873, with a capital of £10,000, in £5 shares. No mortgage debt has been incurred. By the Bill the Company seek power to raise an additional £10,000. The original capital will, of course, be entitled to ten per cent. dividend, while the additional is limited to seven per cent., the sliding scale being applied in each case. We need hardly say that the £5 shares are to be registered as half shares. Old and new capital, when fully paid, may be converted into consolidated stock. Borrowing power to the usual extent is prayed in respect of both classes of capital, with the customary restrictions in the case of the additional, it being understood that not more than £2000 of capital is to be issued in any one year. The ordinary arrangements are made for the transfer of the "limited" to the incorporated Company. Gas of fourteen-candle power, tested by the "London" Argand burner, No. 1, is to be supplied at the usual pressures. The initial price is to be 5s. 6d. per thousand feet. Power is asked to form an insurance and reserve fund, and to convert borrowed money into capital at interest not to exceed five per cent. Auction clauses are necessarily inserted.

The *Malton Gas Bill* is to dissolve and re-incorporate the Malton Gaslight and Coke Company, which was formed in 1836, with a nominal capital of £24,000, of which over £5000 remains to be paid up. By the Bill the Company seek power to raise an additional amount of £24,000, on which it is proposed to pay only a five per cent. dividend. The Bill subsequently proposes the sliding scale, but this, we think, must be intended to apply only to the original capital. Power is sought to borrow to the usual extent, and to convert money so borrowed into capital entitled to five per cent. dividend. Gas of fourteen-candle power, tested by the "London" Argand burner, No. 1, is to be supplied at the usual pressures. The initial price is to be 4s. 3d. per thousand feet. Auction clauses are not sought.

There other sixteen Bills are intended to confer additional powers on Companies already incorporated.

The *British Gaslight Company, Limited (Staffordshire Potteries) Bill* is intended to authorize the Company to expend a further sum of £75,000 on their Staffordshire undertaking. Gas of fourteen-candle power is to be supplied in future, tested by the burner now in use.

The *Chester Gas Bill* is intended to authorize the Chester Gas Company to raise additional capital. The Company were incorporated in 1858, and by their Act and another passed in 1870 the Company obtained power to raise the sum of £80,000, and borrow to the extent of £20,000. Nearly all this capital has been called up and expended. By the Act now applied for they seek permission to raise an additional sum of £50,000, carrying the usual borrowing powers. The additional capital is to be entitled to six or seven per cent., according as it is issued as preference or ordinary. The Company restrict themselves to the period of three years for the payment of back dividends.

The *Cork Gas Bill* is to confer additional powers on the Cork Gas Consumers Company. The Company were incorporated in 1868, and their present capital is £150,000, and they have borrowed to the extent of £20,000. By the Bill the Company seek power to raise an additional sum of £25,000, with borrowing powers to the usual extent. Subject to the sliding scale, the dividends on the new capital will be limited to six or seven per cent. New shares are to be sold by auction or tender. The Company propose for the future to make the standard price of gas 4s. 6d. per thousand feet within the district of the Corporation of Cork, and 5s. outside. As might have been expected, they seek power to manufacture, sell, or let on hire all sorts of apparatus for the use of gas for other than illuminating purposes. The Bill further provides that the Corporation of Cork may, if they so desire, purchase the Company's undertaking within three years of the passing of the Act.

The *Dartford Gas Bill* is to authorize the Dartford Gas Company to amalgamate with the Darenth Vale and the Greenhithe Gas Companies, such amalgamation to take effect on the 1st of July of the current year. The share capital of the three Companies is to be divided into three classes, which need not here be particularized. It is proposed to raise additional capital to the amount of £50,000, carrying

the usual borrowing powers. The dividends on the new capital are limited to the customary rates, subject to the sliding scale. The price of gas in Dartford and the immediate neighbourhood is to be 4s. 6d. per thousand feet, and 5s. in the parishes beyond. The new capital is, of course, to be offered by auction or tender.

The *Eastbourne Gas Bill* is to confer further powers on the Eastbourne Gas Company, incorporated in 1868 with a share capital of £50,000, all of which has been raised and expended, and the Company have borrowed on mortgage to the extent of £12,500. By the Bill they seek power to raise an additional sum of £150,000, with power to borrow to the usual extent; it being understood that £9375 may be borrowed for every £37,500 of capital issued with the ordinary restrictions. The new capital is, of course, to be offered by auction or tender. Subject to the sliding scale, it is proposed to limit the dividend to six or seven per cent. Fourteen-candle gas is to be supplied, tested by the customary burner at the usual pressures. The initial price to be charged is 4s. 7d. per thousand feet.

The *Hyde Gas Bill* is to confer additional powers on the Hyde Gas Company, who were incorporated in 1855 with a share capital of £36,000, and power to borrow £9000, the whole of which has been issued and expended. The Company now seek authority to raise a further sum of £56,000, and to borrow to the usual extent. The new capital is, of course, to be offered by auction or tender. The dividends on the new capital are limited to six or seven per cent., according as it is issued as preference or ordinary. Gas of fourteen-candle power is to be supplied, at a maximum price of 5s. 6d. per thousand feet. The test-burner is to be the "London" Argand, No. 1, and the customary pressures are prescribed.

The *Lincoln Gaslight and Coke Company's Bill* is to enable the Company to raise additional capital, and to authorize the re-arrangement of that already issued. The present capital is £112,500, and by the Bill the Company propose to raise an additional sum of £40,000, carrying the usual borrowing powers. The new capital is, of course, to be offered by auction or tender, and is to be entitled to only seven per cent. dividend. The sliding scale is proposed, and the whole capital of the Company, both new and old, is to be converted into consolidated stock, entitled to varying rates of dividend.

The *Liverpool Gas Bill* is to authorize the Liverpool United Gas Company to raise a further sum of money by way of loan. The present capital of the Company is £938,837, and they have borrowed on mortgage £160,000. The Bill we notice is to enable them to borrow a still further sum of £70,000 for the erection of new works.

The *London Gaslight Bill* has been already noticed in our columns. It is simply to authorize the Company to deal in all kinds of apparatus for the consumption and utilization of gas. No capital is asked for.

The *Maidstone Gas Bill* is to enable the Maidstone Gas Company, with a present capital of £50,000, to raise a further sum of £80,000, carrying the usual borrowing powers, for the erection of additional works on lands described in a schedule. The present capital, now bearing different rates of dividend, is to be converted into consolidated stock entitled to interest at seven per cent. Power is also sought to deal in apparatus for the general utilization of gas for other than illuminating purposes. Authority is asked for to sell gas in bulk to local bodies. The new capital is to be offered by auction or by tender, and, subject to the sliding scale, is to be entitled to seven per cent. It is now proposed to supply fourteen-candle gas, tested by the No. 1 "London" Argand burner. The standard prices are to be 4s. per thousand feet within three miles of the Town Hall, and 5s. within the limits of the Company beyond.

The *Phœnix Gaslight and Coke Company's Bill*, the general scope of which has been more than once noticed in our columns, is, first of all, to authorize the Company to amalgamate with any other Gas Company south of the Thames, save and except the Crystal Palace District Gas Company. A scheme has been settled by virtue of which the Phœnix will, in all probability, at once join the South Metropolitan, under powers conferred by this Company's Act of 1876. As a large addition to works is proposed, new land is wanted, and fresh capital of one million sterling is asked for, with borrowing powers to the extent of one-half of that sum. The Company propose to subject themselves to all the most recent Metropolitan gas legislation. An initial price of 3s. 9d. per thousand feet is named in the Bill. We should have mentioned above that, to place the Company on an equality with the South Metropolitan, it is proposed to make the standard dividend on the new capital—subject, of course, to the sliding scale—ten per cent. Borrowed money is not to bear interest at a higher rate than five per cent.

The *Prescot Gas Bill* is to confer further powers on the Prescot Gas Company, incorporated in 1867 with a nominal capital of £9000, and with borrowing powers to the extent of £2000, all of which has been raised and expended. The Company now propose to raise £16,000 of additional capital, and to borrow to the usual extent of one-fourth. The new capital is to be offered by auction or tender, but no sliding scale is proposed. The illuminating power of the gas is to remain the same as before, but the Company desire to substitute Sugg's "London" Argand burner for that hitherto used.

The *Reading Gas Bill* is to authorize the Company to raise further capital for the purchase of land and the construction of additional works. The present capital of the Company is £80,000, and they may borrow to the extent of £20,000. By the Bill authority is sought to raise new capital to the amount of £120,000, with corresponding borrowing powers. The new capital is to be disposed of by auction or tender, and the dividend on it is to be limited to seven per cent. The Company propose to supply fourteen-candle gas, tested by the "London" Argand burner, No. 1.

The *South Metropolitan Gas Company's Bill* may be said, *mutatis mutandis*, to be a copy of part of the Phœnix Company's Bill above noticed. The same amount of capital is asked for, and the same land is scheduled.

The *Wandsworth and Putney Gas Bill* is promoted to enable the Company to raise further capital. They have at present raised and expended £70,000, and owe on mortgage £16,000 By the Bill they seek to be empowered to issue further capital to the amount of £120,000, carrying the usual borrowing powers. The dividends on this new capital are limited to six or seven per cent., according as it is issued as preference or ordinary.

The *Yeadon and Guiseley Gas Bill* is to empower the Company to raise further capital. The present capital of the Company is £29,325, and they have borrowed to the extent of £7300. By the Bill the Company seek authority to raise an additional sum of £30,000, carrying the usual borrowing powers. The new capital is to be offered by auction or tender, and, subject to the sliding scale, is to be entitled to a dividend of six or seven per cent. The price of gas in the district is fixed in the Company's Act of 1868 at 5s. per thousand.

Society of Engineers.—Mr. R. P. Spice, as President of this Society, has issued a circular letter announcing that, in consequence of the resignation of Mr. Graham Smith as Secretary, the Council have appointed to that office Mr. Alfred Elgar, who will enter on his duties immediately. Mr. Spice adds that this gentleman comes to the Society with the highest testimonials for efficiency in regard to his scientific and literary acquirements, and special experience for the work, and not the least is a strong recommendation from the Secretary of the Institution of Naval Architects, whose able assistant he has been.

Mr. Edison's Last Invention.—The Paris correspondent of the *Standard*, telegraphing last Wednesday, says:—"The news that Mr. Edison has discovered a new lamp for domestic use has produced some sensation here, and some of the papers have made almost as much of it as the American journals. The merits of the invention, however, are disputed by electricians of high standing. The Count du Moncel, who is recognized here as the highest authority on electric science, has addressed a letter on the subject to Dr. Cornelius Herz, which is published in this evening's *Temps*. He expresses astonishment at the excitement caused in the Money Market by the praises bestowed on the lamp, which is called 'a great discovery.' 'Edison,' says the writer, 'is an ingenious and fertile inventor, but is not acquainted with the discoveries made before his time. Neither the idea of the telephone nor the realization of the phonograph belongs to Edison. His first lamp was a modification of the one invented by Changy in 1858. The one now announced is the modification of those of several inventors. In 1875 much noise was made about the incandescent carbon lamp of Korloff, the pretension being that one Alliance machine could feed 15 lamps, and yet no more than two have ever been seen working. Reynier and Werdermann, by adding the voltaic arc to that combination, obtained better results. The new Edison lamp revives the Lodyguine lamp in a different shape. The small carbon needles are replaced by laminated carbon, or carbonized Bristol paper separated by metallic tissues carved into the form of a horseshoe, and joined to the semaphore of the circuit by platinum wires, the whole in vacuum, as in Lodyguine's system. That arrangement may be better than anything previous, but it is not an invention of the importance assigned to it by the American papers. The idea of intercalating metallic bodies in the carbonized mass is not new, for it has been realized by Jablochkoff and Kelmer. It is difficult for the carbon horseshoe, so loose and delicate, not to be deteriorated by prolonged incandescence, on account of the caloric action disintegrating the carbonic particles, and the mechanical action of the current which carries them away and deposits them on the sides of the recipient as in Geissler's tubes. The metallic tissues separating the layers of carbon would be damaged. Experience alone will be able to decide, and it is prudent to wait, in spite of the announcement of 50 or 60 foci fed from a single machine. The same may be said of the dynamo-electric machine, which offers nothing new about which the theories put forth would upset the laws of Ohm and Joule, theories which are at variance with the experiments made with every other machine. Edison has given no account of the maximum effects.' The writer finally protests against the *sans façon* of the Americans with regard to European inventions. 'For them electrical science, which sprang up yesterday, was discovered in America. Many examples might be cited, to which the name of M. Prescott is not foreign, but we prefer to say no more. Let the public be on their guard against the pompous announcements which reach us from the New World.'"

Communicated Article.

THE HYDRAULIC MAIN.

By Mr. R. H. Patterson, F.S.S.

Part II.

In considering the part which the Hydraulic Main at present plays in gas manufacture, we must first observe the action of the Exhausters, and the changes which this now old improvement has made in the character and action of the Hydraulic Main. As regards some of the effects of the Exhausters upon the Main, I find conflicting opinions held by engineers of known ability and great experience—opinions, however, which are held hesitatingly, because the exact truth (simple though it may be) has not yet been clearly ascertained. For the present, therefore, I shall avoid these moot points as much as possible.

The Hydraulic Main was adopted in order to prevent a back-flow of gas into the retorts during the time of drawing and recharging—a back-flow which would take place without any back-pressure at all; for the gas would rush down through the ascension-pipes just as the external air rushes into the retorts when the mouthpieces are opened. But of course such a back-flow would take place with greater force when there was a heavy back-pressure, as was the case before Exhausters were employed. But the Hydraulic Main, while thoroughly preventing a back-flow, did so by *permanently adding to the back-pressure*. The pressure of the Seal became added to the back-pressure from the Holders, and also to that produced by the resistance which the gas encounters in passing through the purifying apparatus. Also, the Hydraulic Main allows the gas to saturate itself with moisture, which has the double disadvantage of promoting hydrocarbon deposits along with the condensed aqueous vapour, and of reducing the illuminating power of the gas when burnt.

By-and-by the bad effects of back-pressure became observed. It was found to be the chief cause of the deposits of carbon within the retorts—which in those early times must have been immense, and proportionately injurious. To remedy the back-pressure, Exhausters were adopted. A steam-engine was employed to draw forward the gas from the retorts, and to propel it through the purifying apparatus into the Holders. The Exhausters are always worked to the extent of neutralizing the whole of *this* back-pressure upon the Hydraulic Main. But in some cases this is all, and the back-pressure arising from the Hydraulic Seal is left intact and unaffected by the "Exhaust."

Recently, the practice has been to attack and lighten the seal itself, in order to still further reduce the back-pressure. For this purpose the Exhausters are worked at "a vacuum" (that is, at so many inches beyond what is necessary to neutralize the back-pressure from the Holders, &c., upon the gas in the Hydraulic Main, and thereby to *operate upon the seal itself*. Going still further, some managers prefer to create a vacuum, however slight, *within the Retorts themselves*, in order to withdraw the gas even quicker than its natural lightness would do. In such cases, despite the Hydraulic Main, the Retorts are practically unsealed; but as to how this is done—that is, what is the exact effect of the Exhaust-vacuum upon the liquid in the Main—is a point upon which I find opinions differ. It certainly appears, however, that whatever be the "vacuum" created within the Hydraulic Main, the gas must still bubble up through the liquid. The liquid will be wholly expelled from *within the dip-pipe*, but *outside* it must still stand at its ordinary level in the Main, and the gas, when leaving the dip-pipe, must bubble upwards through the liquid. The internal part of the seal is, of course, removed, but the other part remains. If not, what becomes of it?

The Anti-Dip movement was a great improvement. The Exhausters had removed the original back-pressure (from the gasholders, &c.), and the object of the Anti-Dip is to remove from the retorts the back-pressure *occasioned by the hydraulic seal*. When the retorts are in action the gas is made to pass from the ascension-pipes by a valve-way into the Main without passing through the seal; and this valve or bye-pass is shut when the retorts are being drawn, whereupon the seal is replaced. In short, the gas does not *pass through* the liquid at all, but it traverses its surface throughout the Main. In the most recent forms of the Anti-Dip—since the evil effects of the contact between gas and tar have attracted attention—the gas is not passed into a Hydraulic Main, but travels along a main in which it flows along with the tar which it is depositing.

Speaking roundly, then, since Exhausters came into use, the hydraulic *seal* has lost its self-acting character—the quality for which it has been most highly esteemed—and is made dependent upon the working of the Exhausters. Secondly, the Exhausters in some cases are worked at a vacuum, so as practically to lessen, or altogether overcome, the seal. Further, by the Anti-Dip apparatus, the seal has been actually abolished, at all events when the retorts are in operation.

Next, there is the new movement referred to in much recent correspondence in the Journal, for withdrawing the tar quickly from the Hydraulic Main, so as to keep the liquid which makes the "seal" as much as possible in the form of water, in order to avoid the contact between the cooling gas and the cooling tar. But this cannot be done thoroughly. And on many grounds I venture to make the suggestion, *Why not abolish the Hydraulic Main altogether?* And also, in such manner as *wholly* to remove the gas from contact with the Tar?

Effects of Tar and Naphtha on the Illuminating Power.

So far as I can see, the actual damage done to the illuminating power of the gas by the tar-washing which it receives in the Hydraulic Main has not yet been properly or satisfactorily determined. And really, considering how extensive is the contact between the gas and tar in the present system of gas manufacture, and how serious are the effects attributed to such contact, it is strange that Gas Companies, especially the large ones, do not investigate this question, by instituting carefully conducted experiments. If these experiments are not conducted carefully, and with scientific thoughtfulness, the results arrived at, I make bold to say, may be entirely misleading. For example, there is no fact in this question better known or more clearly ascertained than that a current of gas will lick up naphtha. Bowditch found this, and stated it; Aitken, Young, and others have proclaimed the same thing recently; and, indeed, the whole "carburetting" or carbonating systems proceed upon this fact. Nevertheless, *this is only a part of the truth*, and if accepted as the whole truth, or as true under all circumstances, it will lead to a serious mistake. You may bring naphtha and coal gas together, and yet the result may be the very opposite of what is at present believed; that is to say, instead of the gas licking up or absorbing the naphtha, the naphtha will absorb the hydrocarbons from the gas! As this is a new point, I shall mention the circumstances upon which this statement is made. Several years ago, at the Fulham Gas-Works, a large quantity of cannel had been employed, and consequently a large quantity of the naphthas or light hydrocarbons accumulated in the Tar-well. Seeing this, Mr. Kirkham resolved to employ this naphtha for enriching his gas. Drawing it off from the heavy tar, he employed it in one of his coke scrubbers—the naphtha being allowed to flow down through the scrubber while the gas passed upwards. But the illuminating power of the gas fell off greatly. Mr. Kirkham (as he has told me) at first felt very much puzzled as to the cause of the change. He tried one part of his apparatus after another, never for a moment suspecting that the evil could arise from his carbonating process; but at length, in the course of his investigations, the Naphtha scrubber was turned off, or put out of action, and immediately the gas regained its usual illuminating power! This incident appears to show that the effects of the contact between gas and naphtha depend, *inter alia*, upon the relative *proportions* in which the gas and tar are brought in contact; and that, although when the gas is in very large quantity compared to the naphtha, the latter substance is absorbed by the former, yet when the naphtha is in large relative quantity the result is the very reverse.

This incident at the Fulham works shows how much we have yet to learn as to the actual effects of contact between gas and the hydrocarbons deposited from it. It is possible that the naphtha used by Mr. Kirkham may have contained some portion of the heavier hydrocarbons, and that it was these and not the naphtha that did the mischief. Still, I think with a fact like this before us, it is evident that there is much to be learnt upon this very important question; that careful investigations are greatly needed, and have been too long delayed; and, lastly, that these investigations must be conducted with scientific thoughtfulness, if they are to bring us to firm ground at last.

Imperfect and unsatisfactory as the present knowledge on the subject is, it can hardly be now questioned that the old, or indeed recent idea of benefit from keeping the gas in contact with the tar in the process of cooling or condensation is wrong, and that the object should be the very opposite. There are many facts which, either directly or inferentially, point to this conclusion, and which I have set forth in former articles. But the advantages claimed for some well-known kinds of apparatus—such as the Exhausters and the Anti-Dip—really go to prove the same fact, especially if (as I have suggested) the gain in illuminating power from these appliances is owing not so much to the reduction of the carbon deposits in the retorts, as to reducing or wholly abolishing the tar-washing of the gas in the hydraulic main. The champions of the "Anti-Dip" claim a considerable increase of illuminating power from their apparatus. And as regards the great improvement achieved by the Exhauster, perhaps one of its greatest advantages has still to be recognized; namely, that by reducing to a vanishing-point the force of the seal, it has proportionately lessened that tar-washing of the gas which seems to me so dangerous to the illuminating quality or commercial value of the gas. I suspect that the great gain of gas (usually reckoned at about 10 per cent.) obtained from the employment of Exhausters, by reducing the back-pressure, is not due wholly to the lessening of the carbon-deposits in the retorts, but largely to the great reduction and almost abolition of the said tar-washing consequent upon the reduction of the seal to zero, or thereabouts. And I make bold to say that if the Anti-Dip movement had arisen in the old times, before Exhausters came into use, its champions would have been at no loss for demonstrative proofs of the advantages of abolishing the dip. Think how severe must have been the tar-washing which the gas had to undergo in the early years of the Hydraulic Main (*i.e.*, before the adoption of Exhausters), when the gas had to force its way out of the retorts, through the seal, under a back-pressure of (say) 20 inches. Now that Exhausters are in use, it is only a very small remnant of this pressure—namely, of the seal itself, and as greatly *lightened* by the "Exhaust"—that the Anti-Dip apparatus has to remove; but it is a valuable further step in the right direction, and (apart from its effect in lessening carbon-deposits within the retorts) must sensibly reduce the bad effects of the contact between the gas and the tar.

Why not Abolish the Hydraulic Main?

Having got so far as we have done—(1) by the action of the Exhausters, (2) by the abolition of the Dip except during the drawing and charging of the retorts, (3) by withdrawing the tar quickly from the Hydraulic Main—I really do not make any very revolutionary proposal when I suggest the abolition of the Hydraulic Main itself.

Of course I know that, except as to the Exhausters, the above mentioned changes are still only beginning to be adopted. The Anti-Dip apparatus is not yet in general use; and the prompt withdrawal of the tar from the Hydraulic Main (although an apparatus, partially for this purpose, may have been devised long ago) is as yet little more than a reasonable and apparently popular proposal. But I feel sure that these changes will make their way; and I venture to think my further proposal will do so too.

So long as the Hydraulic Seal is maintained in any form, it is impossible to prevent the evil action of the tar in attracting and withdrawing from the gas a portion of its illuminating elements. Indeed, even under the most favourable circumstances conceivable, if the Hydraulic Main be retained, the gas must still travel, if not through, at least over, and in closest superficial contact with the condensed tar.

The New Receiving Main.

But suppose the Hydraulic Main be dispensed with,—and also in such manner that no contact is allowed between the gas and the tar which it deposits. Suppose that no liquid seal is maintained at all, and that one or other of the anti-dip appliances (preferably a self-acting one) be adopted—and a large choice of them is to be seen in Part 10 of "King's Treatise on Gas Manufacture"—the state of matters would then be this: There would, of course, be a receiving tube or large pipe to receive the gas from each bench of retorts—in other words, so far as external appearance goes, *something like* the present Hydraulic Main would still exist. But there would be no diaphragms or barriers to keep the constantly condensing tar at a considerable depth in the main. There would be no reservoir of tar or liquid of any kind in the tube or chamber. There would be discharging-pipes from the retorts, but no Dip-pipes. The Receiving Main would be simply a gas-chamber; and, also, from this chamber the condensing tar would be constantly drawn *downwards* and away into the Tar-well, leaving the gas to traverse the tube by itself. The wider the "berth" between the gas and the tar the better. The gas, of course, owing to its lightness, would traverse the upper part of the tube; and the tar should not traverse the tube at all, but at once be allowed to pass downwards and away from the gas.

As simply a rough indication of what might be adopted, suppose that a grating or perforated plate were placed horizontally within the present hydraulic main, at such distance from the top as to give much *more than enough* space for the gas to travel above it; the tar, from its specific gravity, would descend, through the grating, into the lower part of the tube; and this lower part of the tube should be constructed in such a manner as to cause the tar to flow away rapidly, and in a course removed from contact with the gas. This would be the new Receiving Main, which externally would somewhat resemble the Hydraulic Main. It would be the ghost of it—but that is all.

Such an apparatus would have some important collateral advantages. As is well known, the deposit of the valuable light hydrocarbons along with the Tar is owing to the chemical attraction which exists between these substances, and depends to a considerable extent upon the temperature under which the deposit takes place. A high temperature lessens the power of such chemical attraction, and tends to keep the light hydrocarbons volatile and part of the gas. In the Hydraulic Main a high temperature is objectionable—(1) because it tends to thicken the tar, and to convert a portion of it into pitch, whereby the commercial value of the Tar is diminished; (2) because serious embarrassment is frequently produced owing to the clogging or entire stoppage of the Dip-pipes by encrustments of the tar in which they are immersed; and (3) because the higher the heat in the Hydraulic Main, the more largely and disastrously will the gas become saturated with moisture.

In the Receiving Main, no such disadvantages and embarrassments can arise from a high temperature, because there is no Water to be vapourized, while the Tar is at once withdrawn, and also never comes in contact with the Dip-pipes. Accordingly, the Receiving Main can be kept, without disadvantage, at a higher temperature than is practicable with the Hydraulic Main; and by means of this higher temperature the light hydrocarbons can be kept volatile—*i.e., retained in the gas* to a greater extent than is the case at present. Further, to effect this object, the Receiving Main may be heated above its natural temperature by special means and apparatus for the purpose.

But something more requires to be done. It will be no small advantage to minimize the deposit of the light hydrocarbons, and to remove the tar at once from contact with the gas; but there remains the task of *recovering* from the tar such portion of the light hydrocarbons as unavoidably must be carried down along with the condensing tarry vapours. However high the temperature of the Receiving Main may be kept for this purpose, Aitken's "Analyzer," or some such apparatus, should be employed, next after the Receiving Main, and into it the withdrawn tar might be made to flow.

Indeed, for the right and effective use of an Analyzer, a change like that here proposed in the antecedent apparatus is indispensable. To let the gas lose its naphtha in the Hydraulic Main, and then restore the naphtha to the gas in the Analyzer, is obviously a defective arrangement. By means of the Receiving Main, however, the temperature required in the Analyzer can likewise be maintained antecedently; and this, together with the instant and entire removal of tar from the Receiving Main, will certainly tend greatly to retain in the gas those light hydrocarbons which it is the object of the Analyzer to re-volatilize and restore to the gas; but which, obviously, can be more readily *kept volatile as part of the gas than re-volatilized when they have become part of the Tar.*

Correspondence.

[*We do not hold ourselves responsible for the opinions expressed by Correspondents.*]

THE HYDRAULIC MAIN.

Sir,—Having read Mr. Patterson's interesting and instructive article on the Hydraulic Main, and on the effects of "back-pressure" in the retorts, I venture to offer an opinion, founded on experiments, as to the results of subjecting gas to pressure in retorts heated to the degree that clay retorts usually are.

Mr. Patterson quotes Malam's process, whereby he allows the gas to pass through a mass of heated material before leaving the retort, ostensibly for the purpose of re-decomposing any tarry vapours into permanent gas. That this would be effective, to a certain extent, I am prepared to admit; but it would also have another effect—viz., to further decompose some of the permanent hydrocarbons into their constituents—hydrogen and carbon, the former passing away as a non-luminous gas, the latter being deposited in the retorts.

In support of this I may state that a process patented by Dr. Redwood desired to accomplish similar results to Malam's, by generating gas in one retort, and then causing the gas so produced to pass first through a Pelouze and Audouin's condenser, to deposit the lighter hydrocarbons, and then to pass through another retort filled with blocks of plaster of Paris and iron tubing—the result being in most cases a moderate yield of gas, but of very low illuminating value; whilst the iron tubing soon became encrusted with carbon (carbide of iron) deposited from the gas during its transit. Again, when carrying out some experiments, in the direction of Mr. Vernon Harcourt's, for the reduction of the sulphur compounds by passing the gas through heated matter, it was found that the material employed became coated with deposited carbon, and the illuminating power destroyed to the extent of nearly 60 per cent. And again, when experimenting on the production of gas from crude petroleum in the first apparatus employed, the gas was generated in one retort, and then made to traverse a series of three more, heated to bright redness, with the idea that any petroleum vapours would be further decomposed. The result was, however, not satisfactory, for a gas of low illuminating power was produced, and the retorts soon became choked with carbon. On discarding the secondary or superheating retorts, the gas produced from the first or generating retort was, on the average, equal to 60 candles.

These experiments all pointed to the advisability of withdrawing the gas from the retorts as speedily as possible, especially where high heats are employed, and a high illuminating power is to be maintained. If, on the other hand, quantity is required and quality is of no object, then by subjecting the gas to a superheating process a large yield of low illuminating value would be the result.

It is with all due deference to Mr. Patterson that I quote the foregoing, and it would be interesting to hear the opinions of others on a matter of such importance. B.

SAFETY LAMPS IN GAS-WORKS.

Sir,—My thanks are due to Mr. William Mann for his practical letter on safety lamps.

Mr. Key's letter I do not quite understand. I do not ask whether an explosion *could* be produced by a Davy lamp, as I am quite aware that "under certain circumstances" an explosion could be caused thereby. It is quite possible experimentally to produce one, or by neglecting a Davy lamp where an escape of gas is taking place, when, by the ignition of the gas inside the lamp, the wire would become red hot, and eventually cause an explosion.

My question is of a practical, not experimental nature, and I shall still be glad to know if an explosion has ever been caused by a Davy lamp when properly attended to; if so, under what circumstances. If Mr. Key would oblige me by publishing the details of the fires that have taken place, or some of the narrow escapes he refers to, he will greatly assist me to avoid such occurrences on my own works. W.

Jan. 9, 1880.

THE PRODUCTION OF STEEL FROM CAST IRON.

Sir,—It may seem a singular expression to say that the English people are slaves to liberty, but such is really the fact. To avoid the evils of monopoly, they willingly allow the industry of the country to be shackled and subjected to the misrepresentations of inspectors, testers, referees, and other well-paid busybodies, although the evils in question could be very much better prevented by setting the national industry at liberty, and opening the door to free and fair competition.

I have been induced to make the above remarks because I am in a position to show that the manufacture of coal gas and the production of steel are intimately associated together, and would, no doubt, long since have been united but for the despotic intermeddling policy of a Parliament which is never done talking about liberty. Every gas manufacturer well knows that if he could only employ in a profitable manner the coke he produces, he could almost afford to give the public coal gas for nothing, because the coke forms nearly 70 per cent. of his products, whilst the gas is less than 15 per cent., so that a very small profit upon the coke would enable him to make a very considerable reduction in the price of gas. Indeed, it is my firm conviction that if a large and profitable employment can be found for gas coke, the price of 14-candle gas in all the principal towns of the kingdom need not exceed 1s. per 1000 feet, at which price competition by every other form of artificial lighting would be utterly hopeless; and even as a heating power, gas might not only "rule the roast," but also furnish the fire for steam and other boilers—a "consummation devoutly to be wished," from an atmospheric point of view. It is not, however, in this country that such a change can be developed, because, prior to any alteration, the British gas manufacturer must subject himself to a tedious, highly expensive, and extremely doubtful parliamentary contest. We must, therefore, look for improvement to those countries where liberty is less talked about, and manufacturers enjoy more freedom. A Frenchman said to me not long ago, "You English are strange people, and I am puzzled to know when you are serious and when you are joking. Thus, you go to great expense and take much

trouble to hang a man, and then you call a coroner's jury, with witnesses, and you make them enter into a solemn investigation as to the *cause* of the man's death! Is this," said he, "done seriously, or is it a joke?" I was unable to answer the Frenchman's question; but it reminded me strongly of what is called the "Gas Act," many parts of which look very like serious jokes.

Turning, however, to the chief object of this letter, I will now endeavour to explain the principles upon which the proposed method of converting cast iron into steel is based, and which method is generally known as the process of crystallization. By way of illustration I take an extremely familiar example—the purification of saltpetre. This substance, when first brought to market in its rough or impure condition, consists of nitrate of potash mixed with various proportions of nitrate of lime, chloride of sodium, and chloride of magnesium, the whole of which are soluble in water, but the one which is the least soluble in cold water is the nitrate of potash; consequently, if we dissolve the rough saltpetre in water, and after evaporating a part of the water we set the remainder aside to cool, the nitrate of potash alone will separate or crystallize from the liquor, and leave the other constituents dissolved, forming what is called the "mother liquor," so that if we pour off this mother liquor we obtain purified nitrate of potash.

To appreciate the resemblance of this process to the one which I am about to describe, we must take a view of the composition of common cast iron, usually called pig iron. This kind of iron consists of two distinct carburets of iron, the amount of carbon in the one being much larger than in the other, so that they may be very conveniently distinguished from each other by the names of carburet and supercarburet of iron, and thus identified we say that common cast iron is composed of carburet of iron and supercarburet of iron, with variable quantities of phosphuret of iron, sulphuret of iron, siliciuret of iron, and occasional traces of manganese, vanadium, and titanium. If now we can find a fluid which will dissolve cast iron as water dissolves rough saltpetre, we have only to evaporate cautiously a solution of cast iron in that fluid, and we shall find that the different constituents of the cast iron will separate or crystallize according to their insolubility in the fluid, and thus we shall be able to separate them from each other. Without using any hyperbolic form of expression, we may say that heat or caloric is the fluid required in this case, and when cast iron is melted we may say that it is dissolved in caloric, and as the carburet of iron is much more infusible or insoluble than the supercarburet, it crystallizes or separates before any of the other constituents; so that if we watch carefully the evaporation of the caloric, or, in other words, the cooling down of a mass of melted cast iron, a time arrives at which the carburet of iron has separated from the supercarburet and the other impurities, and if we then pour these off, as we do the mother liquor from the nitrate of potash, we shall obtain purified carburet of iron, having a uniform composition, and possessing, therefore, uniform strength and tenacity, very much resembling in this respect good cast steel; whilst the impure supercarburet appears to have lost none of the resisting qualities of common cast iron. Here, then, rests the improvement in converting cast iron into steel, for even if the carburet of iron thus obtained is not identical with cast steel, it is, at all events, so freed from the impurities of cast iron as to render easy its conversion into steel.

It can scarcely be necessary now to point out the intimate connection which the making of coal gas has with the production of steel from cast iron. Both of these industries could be carried on upon a most extensive scale, and there is no reason to doubt that the conversion of cast iron into steel would profitably absorb all the coke that would be yielded by our gas manufactories, so that the realization of a large profit upon gas would be no longer necessary to ensure a reasonable dividend; and with respect to the mode of proceeding, the process may be said to explain itself, for the furnaces intended to melt the cast iron could be so arranged in number and position as to receive the whole of the coke red hot from the retorts, and thus not only effect a saving of fuel, but also avoid the nuisance, now unavoidable, created by extinguishing the red-hot coke. The cast iron having been melted and run into a suitable basin, is to be allowed to cool until a film or crust has spread upon it from the circumference of the basin almost to the centre, when this crust must be pierced, by an iron bar, midway between the centre and the circumference, and the basin turned over so as to pour out the fluid portion of the contents, the solid carburet of iron remaining in the basin, and fit for immediate removal.

In my experiments, which were made four years ago, and which I have never repeated and never shall repeat, the largest quantity of cast iron used at one time was 8 lbs., from which nearly 3 lbs. of fluid supercarburet of iron were poured off, and the residuary solid carburet then displayed a beautiful appearance of crystalline facets, mostly of a rhomboidal form. I must here, however, recall to mind the fact that experiments which succeed on the small scale very frequently fail on the large or manufacturing scale, and with this caution I conclude my remarks.

L. THOMPSON.

FROZEN LAMP SERVICES.

SIR,—Your correspondent, "T. R. V.," asks a very pertinent question anent frozen lamps. Last winter, and in the early part of this one, we were much troubled with them; but we got rid of the difficulty by using methylated spirits. The *modus operandi* was to remove the lamp regulator, open the tap, and pour a small quantity of spirit down the pipe, close the tap for a few minutes, and then by introducing a strong wire, and alternately blowing and exhausting the air, we invariably effected a cure. In some cases where the services were near the surface, the cure was only temporary. But the best remedy is certainly to lay the services in wooden troughs, and fill them up with pitch. A large number of our house and lamp services are laid in this manner, and we are gradually doing the whole of them; and during last winter's severe frost not one of the lamp services so laid gave us the least trouble, although some of them were very near the surface.

I will endeavour to give "T. R. V." an idea of the cost of clearing the pipes with spirits, as it happened in our own case. A gallon of spirits, costing 4s., will clear, on an average, about 50 lamps, and this is a fair day's work for a man, where the lamps are not so very far separated. It is, however, difficult to fix a number for a day's work of this kind; but say 50 lamps—man's wages 4s. 6d. + 4s. spirit = 8s. 6d. a day. This is about the cost, as near as I can give it.

Perhaps some of your correspondents who have tried other plans will give the cost in their cases.

W. S. M'G.

Jan. 3, 1880.

Parliamentary Intelligence.

GAS AND WATER BILLS, 1880.

The time for depositing memorials complaining of non-compliance with Standing Orders in the case of the first hundred petitions for private Bills expired on the 9th inst., on which day the following memorials relating to Water Bills had been received at the Private Bill Office:—

Rathmines and Rathgar Township Water Bill, from John Gelston and others.
Rochester Corporation Bill, from R. E. Gosbell and A. K. Robinson.
Southwark and Vauxhall Water Bill, from James Inglis.

The following Bills among the first hundred on the list will therefore go before the Examiners as unopposed:—

British Gaslight Company (Staffordshire Potteries); Burton-upon-Trent Corporation; Cork Gas; Cork Improvement; Dagenham and District Sewage; Denton and Haughton Gas; Eastbourne Gas; Exmouth and District Water; Gaslight and Coke, Commercial, and South Metropolitan as; GHinckley Local Board; Huddersfield Improvement; King's Lynn Corporation; Lancaster Corporation; Liverpool Corporation Water; London Gaslight; Oldham Improvement; Phœnix Gas; Portmadoc Water; Prescot Gas; Sea Water Supply to London; Wrexham Water; Yeadon and Guiseley Gas.

Legal Intelligence.

CLERKENWELL POLICE COURT.—THURSDAY, JAN. 8.

(*Before Mr.* BARSTOW.)

CONVICTIONS UNDER THE METROPOLIS WATER ACT, 1871.

Three summonses were heard at this court to-day for non-compliance with regulations made under the above-mentioned Act. The first was against *William Torrell*, of 47, Rupert Road, Upper Holloway, who was summoned by the Governor and Company of the New River for wilfully neglecting to comply with certain regulations made under the Metropolis Water Act, 1871, and duly confirmed by the Board of Trade.

Mr. LYON, who prosecuted, stated that this was one of three prosecutions by the New River Company, which were very important, not only to the district immediately concerned, but to the community at large. If certain regulations, sanctioned by the Board of Trade were not carried out, the water supplied was fouled and wasted. In this instance the defendant had a waste or overflow-pipe, which discharged its contents into a drain, the consequence being that foul air made its way up the pipe and contaminated the water. The defendant, some months since, received a notice from the Company to remove the waste-pipe, or else to convert it into a "warning-pipe," as described by the Act. The defendant neglected to do this, in spite of frequent cautions that he would be summoned if he did not comply with the regulation.

Defendant pleaded guilty, but said his landlord ought to be regarded as the responsible party.

Mr. BARSTOW said this was a most important prosecution, for the defendant, by his conduct, was likely to spread dangerous fevers. He must inflict a fine of 20s. and the cost of the summons.

Charles Layton, of 12, Upper Hornsey Road, was summoned for having violated Regulation 13, made under the provisions of the same Act. This regulation provides that every cistern which is used in connection with the water supplied by the Company shall be made and maintained watertight, and shall be properly covered and placed in such a position as to render it capable of being inspected and cleansed at any time. It also provides that every cistern shall be furnished with a sound and suitable ball-tap of the valve kind, suitable for the inlet of water.

Mr. LYON said that the defendant had received constant requests to comply with these regulations, but had neglected to do so.

Evidence was given that there was insufficient covering to the defendant's cisterns, so that the water became fouled. There were two cisterns in his house, which were difficult and dangerous to get at, and there were two ball-taps which did not work effectually.

The defence was that the water was sometimes thick, and prevented the valves from working properly. The cisterns were accessible by a ladder.

Mr. BARSTOW said that the New River Company's water had the reputation of being the best in London, and it was highly important that the cisterns should be properly covered and kept clean. He ordered the defendant to pay a fine of 40s. and costs.

Margaret Lane, of 37, Liverpool Road, Holloway, was also fined 20s. and costs for disobeying the same regulations. In this case the defendant said she had no cistern, and was obliged to receive the water in a butt as it came in.

THAMES POLICE COURT.—SATURDAY, JAN. 10.

(*Before Mr.* LUSHINGTON.)

CONVICTION OF THE EAST LONDON WATER-WORKS COMPANY.

The East London Water-Works Company appeared in answer to 56 summonses, upon the complaint of Mr. James Moore, the Secretary of the Improved Industrial Dwellings Company, for having wilfully neglected or refused to furnish with water the Company's houses in the Commercial Road, the rates having been duly tendered or paid.

Mr. WHEELER appeared in support of the summonses; and Mr. WRAGGE on behalf of the Water Company.

Mr. WRAGGE said that he was not aware until the previous evening that there were 56 summonses issued. The understanding come to on Thursday, that the case should be heard to-day, was only in reference to one summons, and he was therefore unprepared with his answer, and thought a further adjournment should be granted.

Mr. WHEELER said that those for whom he appeared had no other course to adopt than to issue the whole of the summonses. The Improved Industrial Dwellings Company were established for the purpose of providing dwellings for the poor, and the first summons affected the building on the north side of the Commercial Road, in which 30 families, numbering about 150 persons, resided. It would be idle to suppose that the Company could continue their dwellings if they were not furnished with a proper water supply, which was the first necessary of existence. Friendly remonstrance had been tried, in order to induce the Water Company to supply water, but without success. The complaints extended over three years, but they reached a climax in November, 1878, and since that time 30 applications for water had been made to the Company. So serious was the evil that the Local Government Board had given notice that unless the water

supply was furnished they would declare that the buildings were unfit for habitation. The duty of the Water Company was regulated by the Water-Works Clauses Act of 1847 (10 & 11 Vict., cap. 17). The 35th section of the Act distinctly stated that the Company should provide a sufficient supply of pure and wholesome water, and that the supply should be furnished at such pressure as to reach the top storey of the highest building in the district. In this case there was an agreement with the Water Company that the water should be supplied to these buildings by meter, so that there was no question as to rates. Under the 63rd section of the Company's private Act, the highest point to which the Company could be compelled to supply water to any buildings was 40 feet above the level of the pavement, and he would be able to show that the height in this case was within the limit. The offences charged against the Company were neglect to supply and a refusal to furnish any owner or occupier with water. The only excuse could be that of non-payment of rates, and in this case he should be able to show that such an excuse did not exist, as the money had been tendered.

Mr. WRAGGE asked whether it was the intention of the Magistrate to take the whole of the summonses. The Clerk had been measuring the premises, and had not completed the work, and, consequently, his defence would be incomplete. In some cases they were below the limits, and in others above.

Mr. LUSHINGTON determined to hear one summons before deciding the course to be adopted in the other cases.

Mr. *William Edward Lee*, architect and surveyor, was then examined by Mr. WHEELER. He said that Morrison's Buildings, on the north and south sides of the Commercial Road, were erected under his supervision. He communicated with the Engineer of the Water Company, and the cisterns in the buildings were placed in position under his direction. In a letter to witness, the Engineer said, "You will get an adequate supply at 40 feet for every moment of the day and night." The cisterns were at the rear of the building, and were placed lower than usual, in order to suit the Water Company's convenience. From the pavement in Union Street, where the Company's main was, the height of the inlet-pipe was 39 ft. 7 in. He considered 40 feet to be a very low level to which to supply water. The New River Company supplied to the height of 70 feet.

In cross-examination by Mr. WRAGGE, witness said that he had been over the building several times in consequence of these complaints. He did not attribute the failure of supply to the recent frosts.

John Hughes, a porter and agent to the Company at Morrison's Buildings, said the tenants had been short of water since September. On the 2nd of December there was no water at all. On that day he wrote to the Engineer of the Water Company informing him of the fact.

In cross-examination, witness said the weather was frosty at the time.

Mr. *James Moore*, examined by Mr. WHEELER, said: I am Secretary and Manager of the Improved Industrial Dwellings Company. From September to the present time I have sent several notices to the Water Company relative to the short supply. I have never heard it suggested that the failure was due to the frost; in fact, I have had no reply from the officers of the Company. We have property elsewhere, and those houses have not been without water. I have received notice from the District Board of Health, to the effect that unless a proper supply of water is obtained the building will be closed. The Company agreed to supply water at the rate of 7½d. per 1000 gallons. The rates had been paid to the end of the year. During the year 1879 we paid £21 6s. 1d. for water. The amount would have been considerably more if an adequate supply of water had been furnished.

Cross-examined by Mr. WRAGGE: At Bethnal Green I think I may say that we are, on an average, three days a week without water.

By Mr. LUSHINGTON: Our cisterns will contain about 35 gallons per family, and if filled once a day this amount would be sufficient.

Mr. *Edward Lawson Thompson*, the chief collector and superintendent of the building, said he had made several complaints to the Water Company, not only in the winter but in the summer time.

Mr. *George Borer*, assistant to Mr. Lee, said he measured the only two of the cisterns on the north side of Morrison's Buildings which required to be measured. Those which were at the rear of the buildings were, from the pavement immediately over the main, 39 ft. 6 in. high.

Mr. *Thomas Blashill*, District Surveyor for Bethnal Green East, said that on Friday he visited Morrison's Buildings, and measured the height of the cisterns. The evidence of the previous witnesses was correct.

This was the case for the prosecution.

Mr. WRAGGE said that the summons now being heard was only in respect of the 2nd of December, on which day there was a severe frost. The Company having now found that the height of the cisterns was within the prescribed limits, would do all they could to furnish a proper supply of water in future. He therefore asked that only a nominal penalty should be imposed.

Mr. *Seaton*, Engineer of the Water Company, said that there was a severe frost on the 2nd of December, and that many people who had a constant supply turned their taps full on during the night to prevent freezing, and this reduced the pressure.

Cross-examined by Mr. WHEELER, witness said it was possible that many complaints were made from Morrison's Buildings during the year 1879. He might have received 30 complaints, and on each occasion sent officers down to find out the cause, and they reported a short supply. The Local Government Board had communicated with the Water Company in reference to the water supply of industrial dwellings.

Mr. *Nathaniel Dullforce*, Chief Superintendent of the Water Company, spoke to the fact of the supply having been reduced by people allowing their water to run to waste.

In answer to Mr. LUSHINGTON, witness said that there was an abundance of water in the Company's reservoirs.

William Story, an inspector of waste water in the employ of the Company, also spoke to the waste of water during the frost.

This being the case for the defence,

Mr. LUSHINGTON said from the evidence it was clear that the Water Company had neglected a statutory duty in omitting to supply the water. The excuse was that on the particular day to which the summons referred there was a frost, which induced people to waste the water. He did not think, if the Water Company had found there had been waste, that this could be regarded as an unavoidable cause. The persons who inhabited the complainant Company's buildings were entitled to a supply of water, and the Water Company having shown no cause why the supply had not been afforded, he should, on the first summons, impose a penalty of £10 and £6 6s. costs.

Mr. WRAGGE then, on behalf of the Water Company, pleaded guilty to the other summonses.

Mr. WHEELER thereupon applied for the full penalty in each case.

Mr. WRAGGE asked for a mitigated penalty.

Mr. WHEELER said that it had cost the Dwellings Company £50 to do that which the Water Company were bound to do, and, therefore, there were no mitigating circumstances.

Mr. LUSHINGTON, in each of the 25 cases relating to the north side buildings, inflicted a penalty of £2 and costs, the remaining cases to stand adjourned *sine die*.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

The Chief Gas Examiner for the Metropolitan Board of Works (Dr. Williamson, F.R.S.) has just presented his report on his examination of the gas supplied in the Metropolis by The Gaslight and Coke, Commercial, and South Metropolitan Gas Companies, during the quarter ending Dec. 31, 1879, of which the following is an extract:—

I. *With regard to Illuminating Power.*—The maximum, minimum, and average in standard sperm candles, at each of the testing-stations, was as follows:—

	Max.	Min.	Aver.
The Gaslight and Coke Company—			
Beckton (common gas)	18·3	16·5	17·3
Friendly Place ,,	17·3	16·4	16·7
Millbank Street (cannel gas)	22·6	20·0	21·5
Ladbroke Grove (common gas)	19·4	15·9	17·1
Devon's Road ,,	17·7	16·2	16·8
Carlyle Square ,,	17·6	16·0	16·7
Camden Street ,,	18·4	16·0	16·4
Graham Road ,,	19·3	16·4	17·3
Commercial Gas Company—			
Parnell Road	17·9	16·2	17·0
Wellclose Square	17·8	16·2	16·9
South Metropolitan Gas Company—			
Hill Street, Peckham	17·8	15·6	16·4

From these results it will be seen that at all the stations of the three Companies, with the exception of Ladbroke Grove of The Gaslight and Coke Company, and Hill Street, Peckham, of the South Metropolitan Gas Company, the minimum has been equal to, or above the parliamentary standard. The average at all the stations has been above the requirement of the Acts of Parliament.

II. *As regards Purity.*—Sulphuretted hydrogen has not been present in the gas at any of the stations. The proportions of sulphur in other forms than this, in 100 cubic feet of gas, were as follows:—

	Max.	Min.	Aver.
The Gaslight and Coke Company—			
Beckton	18·7	6·9	11·7
Friendly Place	16·7	8·4	12·6
Millbank Street	18·9	8·7	11·9
Ladbroke Grove	16·3	7·1	11·0
Devon's Road	20·8	9·9	15·0
Carlyle Square	22·0	9·7	15·6
Camden Street	16·7	9·0	12·6
Graham Road	21·5	8·4	15·3
Commercial Gas Company—			
Parnell Road	19·5	7·1	12·9
Wellclose Square	20·6	6·1	11·3
South Metropolitan Gas Company—			
Hill Street, Peckham	19·6	8·5	14·4

From these results it will be seen that at all the stations of the three Companies (with the exception of Devon's Road of The Gaslight and Coke Company) the maximum has been within the limits allowed by the Acts of Parliament and the average considerably better than the legal requirements, more especially at the Millbank Street, Ladbroke Grove, and Camden stations.

Ammonia has been present, in slight quantities, in the gas throughout the quarter at all of the stations of the three Companies. At the Devon's Road station it only appeared once during the quarter.

READING GAS SUPPLY.

At the Meeting of the Reading Town Council last Thursday—the MAYOR (Mr. H. B. Blandy) presiding—the Sub-Committee appointed to take steps with reference to the proposed new Act of the Reading Gas Company reported that the Bill had the following for its objects:—

1. To enable the Company to increase their present capital from £80,000 to £200,000, by the creation and issue of new shares or stock, and to increase their power to borrow on mortgage from £20,000 to £50,000, the Company having, as stated in the preamble of the Bill, unexhausted powers under their existing Acts to raise capital to the amount of £14,000, and to borrow £3000.

2. To empower the Company to purchase a triangular piece of land, situate in the parish of St. Lawrence, lying between the South-Eastern Railway and the River Kennet, containing 12 acres 2 roods and 25 perches, or thereabouts, and forming, in fact, the extreme south-east corner of the parish of St. Lawrence, south of the railway, and to construct new works upon these lands; it being the intention of the Company eventually to transfer nearly all their works for the manufacture of gas and their other manufacturing works to this site.

3. To empower the Company to make a new road from the King's Road (near the entrance to their present works) to the site of the proposed new works, and to carry the proposed road over the River Kennet by a bridge.

4. To empower the Company, the Urban Sanitary Authority, and other necessary parties, to enter into agreements with respect to the extinguishment of certain rights of footpath possessed by the Sanitary Authority, from the Forbury Road, near Blake's Bridge, through the lands of Messrs. Huntley and Palmer and Mr. W. I. Palmer, to the sewage pumping station, and with respect to the construction, maintenance, and user of the proposed new road and bridge.

5. To substitute for the standard burner prescribed by the Reading Gas Act, 1862, for testing the illuminating power of the gas supplied by the Company, "Sugg's London Argand Burner, No. 1," and to fix the quality of the gas, with respect to its illuminating power, at 14 sperm candles of six in the pound.

The Committee state that they have considered the Bill generally, and particularly the questions above mentioned, and have also discussed the same, at two meetings, with a Committee of Directors of the Gas Company, consisting of the Chairman (Mr. J. O. Taylor), the Vice-Chairman (Mr. Lewis Cooper), and Sir Peter Spokes; the Secretary (Mr. R. Bradley) and the Engineer and Manager (Mr. Edward Baker) also being present. The Directors had expressed their desire not to interfere with (otherwise than as above mentioned) the settlement embodied in the Reading Gas Acts, 1862 and 1870, or to diminish the force of the provisions contained in those Acts for the protection of the public and the gas consumers; and had intimated their readiness to consent to certain modifications which had been suggested in the Bill as it stands, if upon further consideration they should appear to be necessary; also to provide in the Bill that the place for testing the illuminating power of the gas should be in the Municipal Buildings; and also for the protection of the public interests in regard to the sewers, the water power at Blake's Lock, and other similar matters. The Committee have very fully discussed with the Directors the questions connected with the construction, maintenance, and user of the proposed new road and bridge, and have arrived at an agreement on the point, which agreement was fully set forth in the report. The Committee then state that they are perfectly satisfied with the proposed new burner, as the one now generally adopted as a test-burner. Having regard to the fact that the proposed powers for the increase of capital and for the acquisition of lands by the Company would, both financially and as regarded their facilities for extending their works and erecting new works, place the Company upon a permanent footing, and render it unnecessary for them to go to Parliament again for many years to come, the Committee felt strongly that the new Act should provide for an increase in the minimum standard of illuminating power from 14 to at least 15 candles, with power to the Corporation to require it to be yet further increased. The Committee were also of opinion that the

maximum charges allowed to be made for gas supplied by the Company, as fixed by the Reading Gas Act, 1870, should be reduced so as to make the prescribed maximum accord more nearly with the actual charges now made by the Company to the different classes of consumers. If provisions were inserted in the Bill for these purposes, the Committee state they would be willing that the Bill should also contain a provision for a just and equitable increase of the maximum rate of charge now allowed to be made for gas, in the event of the Company being required to increase the illuminating power beyond the standard of 14 candles proposed in the Bill. The Committee had considered at some length the question of the propriety of endeavouring to restrict the powers proposed to be obtained by the Company, and to impose upon them the liability to dispose of any superfluous lands of which they may be possessed, and to appropriate the proceeds to the reduction of capital. The Committee thought that the very large increase of capital proposed was altogether disproportionate to the reasonable requirements of the Company; but they were of opinion that, having regard to all the circumstances of the case, the provisions of the existing Acts would be a sufficient safeguard to the public and the gas consumers against any undue increase or unnecessary expenditure of capital, and consequent tendency to keep up the price of gas, if the questions of the prescribed illuminating power and the maximum charge for gas were placed on a more satisfactory footing, as suggested. The Committee further reported that, acting under their instructions, the Town Clerk had returned an answer to the parliamentary notices served upon him on behalf of the Corporation, as the Urban Sanitary Authority, dissenting from the Company's proposed undertaking.

Alderman ANDREWES, in bringing the report before the Council, said that nothing could be more satisfactory than the way in which the Gas Company had discharged their public functions—and in that remark he included the Directors of the Company, and also Mr. Baker, the Engineer and Manager, who had certainly earned all the credit he had obtained, and deserved all the confidence the Company could repose in him. When, however, the proposed new Act was discussed between the Sub-Committee of the Gas Committee and a Committee from the Gas Company, some little divergence of opinion naturally arose upon two or three points. He was happy to say that upon some points they had no difficulty in coming to a preliminary understanding—such as the very important rights of the Sanitary Authority over lands of Messrs. Huntley and Palmer and Mr. W. I. Palmer. But there were two or three questions upon which the Company took very strong and decided ground; and it was because the Sub-Committee felt they would not be right in yielding their own judgment without referring the matter to the whole Council that they brought up the report they had. Anticipating that the matter would be referred to a Committee of the whole Council, he would not enter at large into the questions, but would simply say a very few words in justification of the course the Committee had taken. The Gas Company proposed to increase their capital from £80,000 to £200,000, and their borrowing powers from £20,000 to £50,000. The Committee had every confidence that in asking for this increased power a very wise discrimination would be used by the Company in their expenditure. When similar proposals had been made before for larger capital than appeared to Parliament to be desirable, the amount had been to a certain extent cut down by the Parliamentary Committee. He did not know what special reason the Company had for asking for so much additional capital, except it might be that they did not wish to be compelled to go to Parliament again within so short a period—eight and ten years—as elapsed between their last applications. There must be reasons why it was desirable that the Company should periodically go before Parliament, in the interests of consumers, as it was only on these occasions that any direct concessions could be obtained from companies, and there were always questions it was desirable to solve. This being the case, he thought there was sufficient justification for their asking the Company to reduce the proposed amount of their borrowing powers. As to the purchase of land, a satisfactory conditional arrangement had been made, and no objection could be taken to the formation of the bridge over the Kennet or the introduction of the Sugg burner for testing purposes. As to the illuminating power of the gas, however, the present standard, which was practically 14 candles, had existed a great many years; and as they were prepared to pay a higher price, they could not see why the Company should object to at once give them gas of 15-candle power, and the right to call for 16 or even more, if they were ready to pay for it, and the necessities of the town appeared to demand it. Another question in dispute was the maximum price to be fixed for the gas supplied. At present the price charged was about 9d. per 1000 feet below the maximum, and the Committee thought that as in the Acts of 1862 and 1870 the maximum was reduced, and as there was so wide a margin between their highest charge and the maximum they were able to charge, they ought to reduce the maximum *pro tanto*. Under all these circumstances the Committee had thought it advisable to bring the question before the Council, rather than yield to the request of the Company, or suggest anything in the form of opposition to it. They had such confidence in the maintenance of the good feeling which had always existed, that they did not fear any difficulty in coming to an understanding. He moved that the report be received and entered on the minutes.

Mr. SIMONDS seconded the motion.

Mr. COLEBROOK said they must all rejoice that the town had grown so considerably as to necessitate an increased provision of light, and they could have no quarrel with the Gas Company for seeking to supply a felt necessity. He wished to know if the Gas Committee had considered the desirability of the town becoming possessed absolutely of the gas-works, by agreement or otherwise. He believed some towns had done so with great advantage, though possibly there might be others to whom it had not been advantageous; but the question was fairly open to consideration whether towns should not regard light as they did water. It might be that if there should be a time for considering the question it was now. He offered no opinion himself, but should be glad to know whether the Committee had at all given the matter their consideration.

Mr. MESSER said if it was intended to discuss the matter in committee, he thought it would be best to let it drop at this stage.

Alderman ANDREWES thought the Council would do wisely to refrain at present from a discussion of the question. He would therefore simply say, in reply to Mr. Colebrook, that the question of the purchase of the gas-works had not been altogether overlooked by the Committee; but he feared the time had gone by when anything like a satisfactory arrangement could have been made in this direction. He felt that at one time it would have been wise for the Council to purchase the works, but considering the present value of the property, and that the shares only paid from 4½ to 5 per cent., he thought there was little chance of the town getting much from their acquisition, especially with the question of the electric light looming in the distance.

The motion was then put and carried.

Alderman ANDREWES then proposed that the report be referred to a Committee of the whole Council.

Mr. SIMONDS seconded the proposal.

Alderman PALMER suggested the advisability of obtaining the assistance of an expert in the matter. He said he was glad to know, from Alderman Andrewes and other sources, that the Gas Company were meeting the Council in an open-handed and very friendly way, and that there was no ground for supposing that they were going to get into any difficulties with the Company.

The MAYOR said he was a Director of the Gas Company, and therefore his remarks might be taken for what they were worth. He should be very sorry, not in the interests of the Company, but of all peace and quietness, if, upon subjects which were matters of common sense and not of scientific difference of opinion, they should introduce an expert, whose duty it would be to make opposition for them, and thereby probably embitter matters.

Alderman ANDREWES said the Committee had recently had an interview with Mr. Sugg, and it was upon his advice that they sought to get a higher standard of illuminating power. They would probably have taken further advice, but their Parliamentary Agents had already been consulted by the Gas Company, who had thereby cut the ground from under their feet.

The resolution was then carried unanimously.

BILSTON GASLIGHT AND COKE COMPANY.

The Annual General Meeting of this Company was held on Monday, the 5th inst.—Mr. T. HOLCROFT in the chair.

The SECRETARY and MANAGER (Mr. J. S. Reeves) having read the notice convening the meeting, the following report and statement of accounts were presented:—

The Directors herewith present to the Shareholders their 34th annual report, together with statement of accounts.

The trade account shows a profit of £3150 9s., which with £1822 7s. 7d. brought from last year's account, makes a total of £4972 16s. 7d.

The Directors propose to appropriate this amount as follows:—

Half year's dividend of 4s. per share paid Aug. 1, 1879	£1400 0 0
" payable Feb. 1, 1880	1400 0 0
Debenture interest	421 5 0
To reserve-fund	200 0 0
Carry forward to next year's account	1551 11 7
Total	£4972 16 7

The Directors have pleasure in reporting that although the continued depression of trade has prevented any considerable increase in the sale of gas, the results of the year's operations are not unfavourable, especially when it is borne in mind that a reduction of 3d. per 1000 feet in the price of gas took place at the beginning of the year.

In accordance with the powers conferred upon them by the Shareholders, the Directors have issued the £5000 of debentures referred to in last year's report.

The old works at Moxley and the land adjacent thereto are still offered for sale.

It is with deep regret that the Directors record the loss which the Company has sustained during the year by the death of its Chairman, the late William Hatton, Esq. He had been connected with the Company for 27 years, during the last 15 of which he had filled the office of Chairman, in which position his ability and large business experience had been of invaluable service to the Company, and had contributed much to its success. Mr. Thomas Baker, who was associated with the Company from its commencement, is also deceased; and the Shareholders will have to elect two new Directors to fill the vacancies thus caused.

Trade Account for the Year ending Sept. 30, 1879.

Dr.				Cr.		
Value of stock, Sept. 30, 1878	£284	0	0	Gas and meter rent	£9,488	7	2
Coal	5,411	19	11	Residual products	4,734	15	10
Mains	238	18	11	Sundries	757	11	7
Meters	316	14	5	Estimated value of stock	400	0	0
Retorts, fire-bricks, stores, wear and tear of works, &c.	850	7	10	Amount expended on works	492	9	3
Materials and machinery for new works	492	9	3				
Wages	2,759	12	4				
Salaries and Directors fees	604	0	0				
Rates and taxes	508	10	0				
Stationery	44	15	8				
General charges	453	12	3				
Abatements	197	14	3				
Amount written off works account for depreciation	560	0	0				
Balance, profit, carried to profit and loss account	3,150	9	0				
	£15,873	3	10		£15,873	3	10

The CHAIRMAN, in moving the adoption of the report, said that it was with mingled feelings of regret and pleasure that the Directors met the Shareholders on this occasion—regret that for the first time for many years they missed the familiar face of one who had been accustomed to address them from the chair; he referred to their late Chairman, Mr. William Hatton. In the expression of feeling contained in the report relative to their loss he was sure the Shareholders would all concur. The exceptional ability possessed by Mr. Hatton made him (the Chairman) feel great diffidence in attempting to fill the position which he occupied that day. It was, however, a pleasure that, in a year in which trade had been so remarkably stagnant, they were able to meet the Shareholders with so favourable a statement of account. The profits were not quite equal to those of last year. This was due to the low price obtained for coke, and the reduction which had taken place in the charge for gas; but the improvement which had set in, in the trade of the district, gave promise of more favourable results for the ensuing year. He congratulated the Shareholders on the possession of the convenient and commodious offices in which they were met that day for the first time, and he believed, upon an inspection of the works, they would find that they also were convenient and substantial.

Mr. COLBOURN seconded the motion, which was unanimously agreed to.

A resolution authorizing the payment of the usual dividend of 8 per cent. was passed.

The retiring Directors (Messrs. Holcroft, Hickman, and Bradley) and Auditors (Messrs. T. S. Hatton and E. Ellis) were then re-elected.

For the two vacant seats at the Board there were five candidates—Messrs. E. Pugh, P. Bullock, J. Holliday, S. Thompson, and J. H. Farmer; and on a vote by ballot being taken, the first two were elected.

A resolution was afterwards carried empowering the Directors to remit a debt of £30 for gas-fittings supplied to some new schools which had been built in the neighbourhood by public subscription.

The thanks of the meeting having been given to the Directors and Officers of the Company, the proceedings ended.

THE GAS SUPPLY OF LIMERICK.—The transfer of the United General Gas Company's works at Limerick to the Corporation has been completed, the property having been handed over to the town authorities on the 1st inst. The purchase-money, including the cost of various extensions in progress, was £28,000. The two gas-works supplying the city—viz., those originally belonging to the Corporation, and the works recently acquired from the Company—will now be amalgamated, which will involve some considerable rearrangement and concentration of the manufacturing plant, and a complete reorganization of the mains and service-pipes throughout the city. This responsible duty has been entrusted by the Council to Mr. Thos. Newbigging, of Manchester, who will advise as to the best method of carrying out the alterations.

ON REGENERATIVE GAS LIGHTING.

By Herr F. Siemens.

[A Lecture delivered before the Society for the Promotion of Industay in Prussia.*]

As early as 20 years ago, at the period when the results of our heat regenerative furnaces were first demonstrated, I had some thoughts of using the same means of economizing the combustible materials used in the production of light, and with a view also of obtaining a light of intense power. The want of success which attended the experiments made at that time seemed to prove the impossibility of properly supplying a gas-flame with heated air, owing to my supposition that double glasses or chimneys, one within the other, were necessary in order to bring the combustion gases and the fresh air together, and the inner glass could not withstand the heat. Later experience of regenerative gas-furnaces taught me to utilize the natural currents of gas and heated air within a large clear oven or furnace chamber, to obtain better combustion of the gas, and consequently the former system of separate combustion chambers was entirely abandoned. It was found that a direct or artificial conjunction of the gas and the air in a special mixing chamber was very disadvantageous, not only with regard to perfect combustion, but also to economy of fuel and the durability of the furnace, and was in every way inferior to free combination caused by natural currents. The regenerative principle could only be applied to lighting purposes by taking advantage of the automatic motion of air, gas, and the products of combustion at different temperatures. The introduction of the electric light, and the opportunity thereby created for the employment of burners of higher lighting power, led me to return to this subject. The first experiments made with the mixing arrangements on the principle just described clearly proved to me that it was possible to obtain very satisfactory results by simple means.

I will now describe the three varieties of apparatus actually constructed, and the accompanying drawings show four varieties of them.

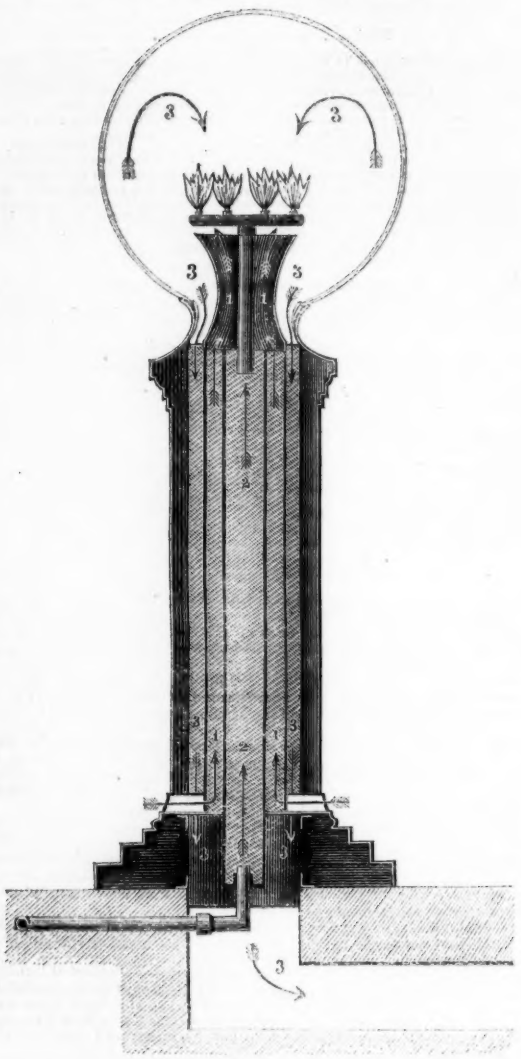

Fig. 1.

Variety A (fig. 1) is a pillar lamp, which, as may be seen by the drawing, consists of three concentric tubes, surmounted by a glass globe. At the lower part of the globe is an ordinary burner, with six radial flames. All the space in the tubes is filled with wire netting, which I call regenerators, and which serve either to abstract heat from passing gases, or to communicate heat to them. The middle pipe being the gas supply, the air is admitted from below into the second annular pipe, and, passing upwards into the globe, is there burnt with the gas. The products of this combustion pass away down through the annular space of the outermost pipe, into a chimney or aspirator flue. (The arrangement and course of the currents are shown in the drawing.) The wire-net regenerators in the annular space of the outer pipe are thus heated by the products of combustion as they pass away from the globe, and this effect is specially marked in the upper part of the wire-work. The heat thus extracted is communicated by conduction and radiation to the regenerators in the air-pipe, and also through the side to the inside gas-pipe. Air and gas are thus pre-heated, and this pre-heating increases in proportion as the temperature of the flame, increased by the pre-heating of air and gas, increases the temperature of the regenerators in the outer pipe. The increase of temperature, and consequently of the illuminating power of the flame in the globe, continues until the cooling effect of radiation balances the production of heat.

It is necessary to explain the fact that the highly-heated products of combustion, rising upwards in the globe, turn therein and pass away downwards, without affecting the flame or the air supply. This is explained by the rising flame taking the hottest passage in the middle of the globe, while the combustion products, in passing off, naturally take the coolest way, along the inner surface of the globe.

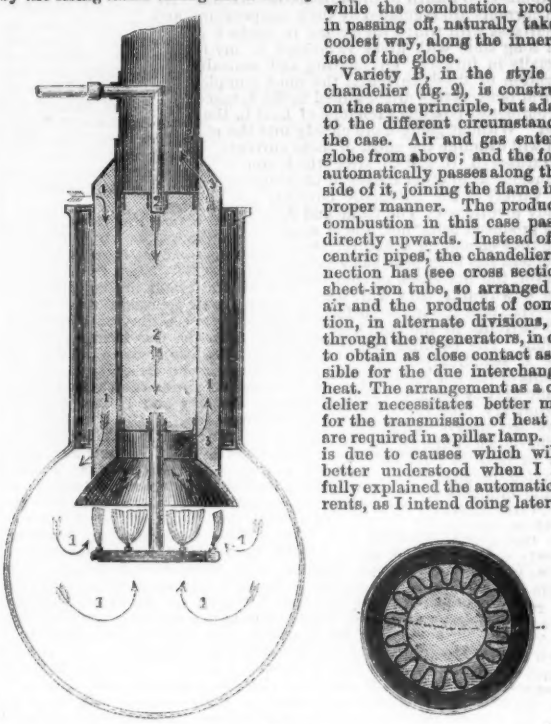

Fig. 2.

Variety B, in the style of a chandelier (fig. 2), is constructed on the same principle, but adapted to the different circumstances of the case. Air and gas enter the globe from above; and the former automatically passes along the inside of it, joining the flame in the proper manner. The products of combustion in this case pass off directly upwards. Instead of concentric pipes, the chandelier connection has (see cross section) a sheet-iron tube, so arranged that air and the products of combustion, in alternate divisions, pass through the regenerators, in order to obtain as close contact as possible for the due interchange of heat. The arrangement as a chandelier necessitates better means for the transmission of heat than are required in a pillar lamp. This is due to causes which will be better understood when I have fully explained the automatic currents, as I intend doing later.

Variety C (fig. 3) represents a regenerative oven on the true principle, the same regenerator surfaces which have absorbed the heat of the combustion products communicating it in turn to the cold air required by the flame. There is only the superficial distinction that the entire oven changes its position instead of the draught. It will be seen by the drawing that the regenerator is in the form of a plate round the horizontal gas-pipe, which serves also for a spindle. The flame is in the centre of the plate. The air necessary for combustion enters the regenerator at the lower edge of the plate, and flows automatically to join the flame, while the products of combustion pass off through the upper portion of the same regenerator. The upper portion of the plate will thus become heated, and can be made to heat the air directly by being continually turned slowly round, so that the heated portion gradually comes below. This style of burner is specially adapted for throwing light in one direction, as a reflector of brass, gun-metal, or china may be used, as shown. As either a hemispherical or entirely globular glass may be used, fixed to the generator or to the spindle, and the flame is fixed in its centre, this design is also as well suited for throwing light in all directions as the previously described varieties, A and B.

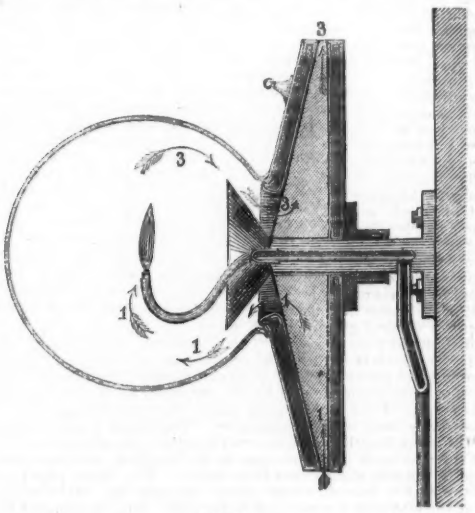

Fig. 3.

A number of other designs might easily be added to these. The heat regenerative system is also applicable to petroleum, solid luminants, and other substances. An alteration which would be very useful in certain circumstances could be made by using the apparatus C, just described, for the production of hot air only, which could be drawn off and used for

* The *Journal für Gasbeleuchtung* for December published the original, from which our translation has been made. The illustrations, too, have been reproduced from our German contemporary.—Ed. J. G. L.

burners in various places. I can prove the possibility of such a method of lighting by an experiment with variety A, taking off the glass globe, and allowing the flame, supported by the hot air from the regenerator, to escape into the open air. The illuminating power of the flame would soon decrease, because the heating of the generator is suspended, and the air supply soon falls to its usual temperature. You will have perceived already that the principle can be used in unlimited numbers of ways, and it is but right that I should point out that the subject is far from being exhausted, but, on the contrary, the applications and advantages of the heat regenerative system, as applied to lighting purposes, have been here set forth only as actually proved by the first incomplete but highly promising trials.

I promised to return to the automatic currents. As already mentioned, these currents are regulated by their temperature, and the temperature of the surfaces with which they come in contact, and I have utilized them for a long time with great advantage in my regenerative gas-furnaces, especially in furnaces for melting and annealing glass. By the proper utilization of these currents, the most complete combustion and most uniform temperature are obtained in the furnace; and, on the other hand, the completest possible exchange of heat in the regenerator can be established. Without going more closely into the particulars of furnace working, I will examine the effect of these currents in the three above-described apparatuses (A, B, and C), after which you will be able to draw your own conclusions as to other means of utilizing them.

In variety A the automatic currents are made use of in the manner already mentioned. The flame and its products rise straight upwards, the gases produced being hot, and of small specific gravity. At the top of the globe they encounter a natural obstacle and turn downwards, unless this movement has been previously induced by the action of the draught. As, however, the hot gases or combustion products have little inclination to move downwards, they will, when compelled to do so, take the coolest way—viz., past the inner surface of the globe. The upward and downward currents in the ball keep as widely separated from each other as possible. The peculiar effects of the automatic currents are also shown quite as favourably in the regenerators of variety A. The downward currents of the hot combustion products always take the coolest way, their specific gravity being greatest there. The upward currents of hot air, on the contrary, take the hottest course. The consequence is that regenerators are always uniformly heated in horizontal layers. The stream moving downwards, as well as the one moving upwards, always tends to keep as near as possible to the surface of the pipe by which they are separated, because directly on the surface of this pipe is to be found the heating influence for the rising current, and the cooling influence for the downward current. With this arrangement the exchange of heat is, therefore, as complete as possible. The general conclusion may be drawn from this that the regenerators must be arranged as nearly vertical as possible, with the hot end at the top and the cold end at the bottom. The results arrived at also prove that such a regenerator system, when placed upside down, effects but a very incomplete exchange of heat, and it is for this reason that in the variety B, where the cold end is at the top, the division-plate is so arranged as to artificially assist the contact between the combustion products which have to be cooled, and the air supply which is to be heated. Hence this design is less suited for giving a very intense light, and the arrangement is made only because circumstances sometimes require a lamp to be suspended overhead. This design, moreover, has the advantage that the globe does not become highly heated, and never blackens, its interior being exposed only to clean though hot air.

In variety C the system of natural currents is modified. The heating of the air in the generator takes place in the proper manner, from below upwards, and the currents in the globes take their natural course; but the absorption of heat is opposite, in consequence of the upward course of the combustion products in the regenerator. This unfavourable circumstance is, however, completely counteracted by constantly revolving the apparatus at a uniform rate by machinery or clockwork. The combustion products are thus prevented from taking hot channels in their upward course, because new and cold surfaces are continuously brought into position by the constant revolution.

There is another and very important fact which requires close examination in view of the successful application of the regenerative system to lighting purposes. There is much heat radiation from the visible flame, but very little from the transparent and invisible products of the flame. For this reason a very large glass globe may be used without incurring any great loss of heat. The invisible combustion products which appear to have a low temperature keep the regenerator glowing hot, as may be seen on inspecting the apparatus. It will also be readily understood that specially designed obstacles, such as the wire netting, for example, are necessary for abstracting and yielding up the heat of these invisible gases, contact of which with such obstacles should be as frequent and intimate as possible. Hence the incompleteness of a system of heating air by passing it through plain tubes, where it meets with no obstruction. This fact can be readily proved by experiment, and I have, in fact, utilized it with considerable success in my glass ovens, the sides of which have to be kept cool by currents of air.

I will now exhibit to you another mode of lighting. Variety D (fig. 4) represents a vertical gas-lamp and retort combined, in which the burner is supplied direct from the coal. This apparatus is designed for use in the open air, for which it is the more suitable, as neither chimney nor fixed attachments are necessary, and it can therefore be employed anywhere. The general arrangement will be clearly understood from the figure. It consists mainly of three concentric pipes, the inner being filled with coal and the outer ones with regenerators. The three pipes, which are of nearly the same length, and connected together, are placed over a furnace, so that the two inner pipes are open to the fireplace, and the outer, which is closed to the fire, stands over it as shown. The inner pipe is provided at the top with a branch, which passes through the other tubes, and is closed at the end with a cover and water seal. This is intended to receive the charge of coal, which drops through the inner tube to the furnace below. At the upper end, above the branch, this tube is closed with a thick plate, through which passes a vertical gas-pipe. The second or intermediate tube, open below, is closed at the top. Below its termination a branching chimney takes off the products of combustion from the furnace. The outer pipe, which is fixed over the furnace, without having any connection with it, but admitting air by a circle of holes at the bottom, closes round the gas-pipe at the top, where it has an orifice in the same horizontal plane. The outside pipe and the furnace are surrounded by a non-conducting coating, so as to retain the heat as much as possible. When the inside tube is filled with coal, and the feeding branch sealed, the furnace is lighted, and the flames, &c., pass up through the intermediate annular space, and find an exit at the chimney, heating in their passage not only the regenerators in the tube, but also the coal in the retort, and the air regenerator or outer pipe. The gas thereby expelled consequently burns at the top, together with the heated air from the outer pipe. The heat of the gas-flame in this case escapes without further use, which is really not material, because the combustion of the coke produced in the retort gives sufficient heat not only to gasify the coal above it, but also to pre-heat the necessary air for the burner. I reserve, however, the power of utilizing the heat of the gas-flame also, if required, by removing the products of combustion through an outer pipe, as in variety A, and providing a separate chimney.

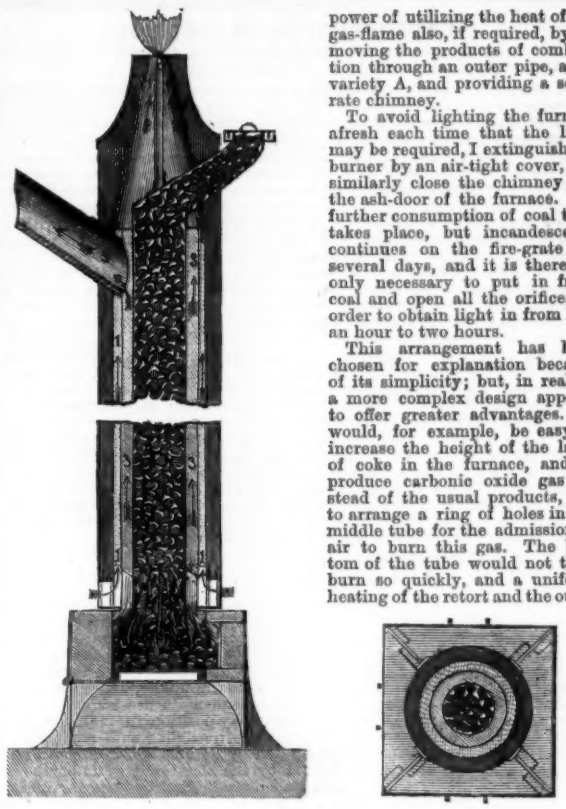

Fig. 4.

To avoid lighting the furnace afresh each time that the light may be required, I extinguish the burner by an air-tight cover, and similarly close the chimney and the ash-door of the furnace. No further consumption of coal then takes place, but incandescence continues on the fire-grate for several days, and it is therefore only necessary to put in fresh coal and open all the orifices in order to obtain light in from half an hour to two hours.

This arrangement has been chosen for explanation because of its simplicity; but, in reality, a more complex design appears to offer greater advantages. It would, for example, be easy to increase the height of the layer of coke in the furnace, and so produce carbonic oxide gas instead of the usual products, and to arrange a ring of holes in the middle tube for the admission of air to burn this gas. The bottom of the tube would not then burn so quickly, and a uniform heating of the retort and the outer air-pipe would result. The burner could also be provided with double air draught, whereby the intensity of the light would be augmented. Several burners could also be used. When unpurified gas is employed, and a fire is also possible, it will be seen that this application of my system of regenerative lighting, combined with a gas-retort, is very economical, and will produce a good light. I consider it of great advantage in open street lighting and for large areas, and to assist in lighting up large works. Stoppages can only arise from accumulations of tar or soot in the gas-pipe when it is not carefully cleaned each day during use. There is no danger even in case of obstruction at this point, for the gas would then escape at the bottom, and pass up the intermediate tube.

I think I have given a clear idea of my system of lighting and the apparatuses in use, to which I give the name of "Light-accumulators," and also of the principles on which they are based. I will therefore only add a few words respecting the globes to be used. Though only the flame, and not its products, radiates heat, yet the glass is made very hot and is easily cracked. To avoid this I harden it so as almost to entirely overcome its tendency to fracture. As regards the intensity of the light, I can safely state that it is at least six times greater than in ordinary gas-burners, but the exact determination of this I leave to more skilled observers. I may, however, point out that the power of the light at present produced is no criterion of the future development of my system, since the apparatus used is still incomplete, and the intensity will be found to vary in different arrangements.

At the conclusion of the lecture the following discussion took place:—

Dr. W. Siemens: I will offer a few remarks as to the rotative generative apparatus (C). The best mechanism for causing it to revolve is still to be found, but I think it might be done easily by electricity. I am of opinion that, with a suitable motor, this form is the best, for all the others have the disadvantage of requiring a special chimney. The wonderful effect of pre-heating in increasing the illuminating power is most conspicuous. The same phenomenon has been observed in the electric light. The increase of light at high temperatures takes place very quickly, so that an increase of temperature alters very considerably the proportion between heat and light radiation. That the lighting effect of the same gas is increased from four to five times, by means of regenerative heating, over the usual method, can only be explained in this way. I do not think there will be any very great competition between the three methods of lighting—viz., common gas, gas which has been pre-heated, and the electric light. Each has its own field, where it will be found most suitable, and there will even be places where all three kinds can be successfully used together.

Mr. F. Siemens: It must not be supposed that this method of lighting is suited for every purpose, because it is not so divisible as ordinary gas lighting.

Mr. Elster said that as the difference between the light given by the French and the usual burners did not prove so great as was at first anticinated, it could hardly be supposed that this system would give four to five itmes more light.

Dr. Siemens: It is, however, quite possible, because the burners hitherto used are not based on the principle of regaining the heat of combustion and using it for the flame. That is the difference. Any one can test it. When the flames of two moveable brackets, each with a fishtail burner, are approximated to each other, a very bright light is obtained, but when the flames are separated again the light becomes disproportionately less.

Mr. Druckenmüller: How is it with the heat evolved?

Mr. F. Siemens: There is proportionately no more heat evolved, but only the intensity of the flame increased. The flame is, of course, hotter, by giving more light, and radiating more heat; but 100° C. more heat makes, on the other hand, a very great difference in illuminating power. The temperature of ordinary gas-flames is 1600° C., but even 1700° is a very bright light indeed, and 1800° is probably the temperature of the electric light.

At the close of the meeting the different regenerative apparatuses were exhibited. Mr. F. Siemens's statements as to their illuminating power were confirmed, and their designs appeared well suited for many of the purposes of lighting.

SALFORD CORPORATION GAS SUPPLY.

The Monthly Meeting of the Salford Town Council was held last Wednesday—the MAYOR (Alderman Robinson) presiding—when,

Alderman SHARP moved—"That the General Gas Committee be empowered to proceed with the following works required in extending the several gas stations, at an estimated cost of £52,600, being part of the works authorized by the Council on the recommendation of the Committee on Jan. 24, 1877, viz.:—At Lamb Lane: New buildings for station governors, meter stores, workshops, and offices. At Regent Road: The completion of the new retort-house, stores, and other buildings, and providing new retorts and retort-fittings for both of the houses. At Liverpool Street: New condensers, exhausters, scrubbers, purifiers, and meters, with the necessary connecting-pipes and buildings." He said that the proposed extensions simply represented another section of the work which the Council had already agreed to undertake, and was part of the £160,000 scheme already sanctioned. When the Council passed the scheme the matter was fully discussed time after time, and an elaborate report and numerous plans were prepared by the Gas Engineer, Mr. S. Hunter. That report and the plans were submitted to one of the most eminent and successful of gas engineers—Mr. George Livesey—and approved by him. The scheme was strongly recommended to the Council, and it was ultimately unanimously adopted. Since then the Gas Committee had had ample time for reconsideration, and this reconsideration had convinced them of the wisdom of their action three years ago. Although so much had already been done towards extending and improving the gas-works, such was the rapid increase in the consumption of gas that it was imperative they should proceed further. In the year ended March last, notwithstanding the dulness of trade, there was an increase of 65 million cubic feet in the gas consumed. Whatever their opinion of gas as compared with the electric light might be, they were compelled to extend their works to meet the requirements of their customers. The extensions now proposed had been well considered by the Committee, and passed unanimously.

Mr. MAKINSON seconded the motion.

In the course of the discussion that followed, it was suggested that the extensions should be held over until something definite was known as to what the electric light promised from America really was worth.

Mr. W. H. BAILEY, however, said that when the electric light was resuscitated some two years ago—it had existed for 25 or 30 years—he was afraid that the gas-works would be a great loss to the public, but he had since found that the only people who recommended its use were the Yankee reporters. He did not know of a man of any position in the engineering world who had dared to say that the electric light would compete with gas. The Council chamber was lighted by 84 burners, at a cost of 10d. per hour. If the room were lighted by the electric light, under the best possible conditions, it would cost 2s. 3d. per hour. He had examined the question in every possible way, and was not afraid of the electric light. There had been a great many improbable statements made about the light, but the men who had written about it were the newspaper men of America who had interviewed Mr. Edison. Mr. Edison made a mistake in saying that he had divided the electric light; he did not divide it at all, for his division was simply addition. The electric light was no cheaper than it was 25 years ago, when Sir John Potter had it on view in Pendleton. There had only been a few improvements in the lamps for the electric light, and gas would hold its own for many years to come.

Mr. KEEVNEY said he had found that the consumption of gas in the borough was doubled in every ten years, and during the last three years the consumption had increased from 500 million to 700 million cubic feet. He thought the Committee were bound to make provision for the increasing demands of the consumers.

Mr. MAKINSON said from time to time, during the last two years, the question of the electric light had come before the Gas Committee, and had been carefully considered by them, and the Gas Engineer had also duly reported upon it. The Committee were bound by Act of Parliament to supply with gas all the consumers within a certain radius, and if they did not do so, they would be guilty of a breach of the law. The consumption of gas had very largely increased during the past two years, but more especially during the last year, when it actually increased something like 10 per cent.—that was to say, 60 million cubic feet—which amount represented what would supply a small market town for a year; so the Council could understand how great the increase was. With regard to the electric light, they had all heard rumours about it, and while gas shares fell one week they rose again the next. He had been assured by the Gas Engineer that at least £47,000 was absolutely necessary for increased improvements.

Mr. DEARDEN said when it was resolved to spend the £160,000 on the gas-works it was understood that the improvements would extend over a period of several years. Three years had passed, and he wished to know how much of the £160,000 would remain after the £52,600 now proposed had been spent.

Alderman SHARP said about £50,000. Whatever the cost might be, the gas department was a trading concern, and was bound to find gas for the people.

The motion was then carried by 41 votes to 5.

PROPOSED PURCHASE OF THE GAINSBOROUGH GAS-WORKS BY THE LOCAL BOARD.

At the Meeting of the Gainsborough Local Board of Health on Monday last week—Mr. PEARSON in the chair—the question of the purchase of the local gas-works by the Board was under discussion.

The CHAIRMAN said that Mr. Gamble had consented to recommend the proprietors of the works to accept from the Board £42,000 in cash. The Board would remember they had expressed a wish that instead of paying a large sum for perpetual annuities, at 3¾ per cent., a fixed sum could be paid. The Company would be willing to leave the sum of £42,000 at 4 per cent. for a period not exceeding 25 years, or for a longer period, on conditions. They would require the Board to assume liability respecting £1339, which was the debenture debt, bearing interest at 4½ per cent., but which they would have the privilege of paying off if they obtained the money on better terms. It was to be distinctly understood that any information the Board obtained, or had obtained from the Company during these negotiations, was to be strictly without prejudice to the Company. Though not exactly treated as a private communication, it was not to be used at any time to the prejudice of the Gas Company. There were minor matters mentioned in the terms. There was about £200 worth of furniture and tools, for which the Company would make no charge, and there were various meters on hire, which would have to be taken over by the Board at a sum of about £250, and which, he was informed, were worth double this amount. Mr. Gamble also made an important stipulation. He (the Chairman) mentioned that he was strongly of opinion that the electric light would before long supersede gas for some, if not for all purposes, and Mr. Gamble stated his willingness to allow the Board the option of throwing up the bargain if, during a year after agreeing to terms, there appeared a probability of the electric light becoming so far likely to supersede gas as to warrant such a step. If the Board did not give up the bargain they would be expected to pay an additional sum for any extension of the works the Company might engage in, which works were necessary in any event. The profit on the works last year was £1940. The Directors took £88, and the interest on the funded account amounted to £50. These would give £2078. Then the interest on the £42,000 would be £1680, from which £35 in respect of property-tax should be deducted, thus leaving as the difference between £2078 and £1645 the sum of £433, which Mr. Gamble said would be the profit derivable by the Board, supposing they continued to carry on the works as he had done. A calculation as to certain arrears would probably give about £100, which should be added to what was made.

In subsequent remarks by members of the Board, it was freely stated that they considered the recent reports from America of what Mr. Edison claims to be doing in reference to the electric light were worth consideration before negotiation went further, and

The CHAIRMAN said he quite agreed with the objections entertained on this ground, but Mr. Gamble had told him that if it had not been for this element of consideration he should have asked £10,000 more.

Mr. GREEN moved that no further discussion of the question should take place at the Board for six months; but it was afterwards agreed that the question be deferred for a fortnight.

WORCESTER AND THE LIVERPOOL (VYRNWY) WATER SCHEME.

At the Monthly Meeting of the Worcester Town Council last Tuesday—the MAYOR (Mr. J. Noake) presiding—the Special Water Committee reported on the action recently taken with regard to the above-named scheme, from which it appeared that communications had been sent to the Corporations of Shrewsbury, Bridgenorth, Bewdley, Tewkesbury, Cheltenham, and Gloucester, asking what course they intended to take in the way of opposition to the Bill, and suggesting that the expenses of opposition should be contributed according to the rateable value of the cities and boroughs joining in the opposition. The Committee recommended the Council to oppose the Bill, and by their instructions notice of this had been advertised.

The MAYOR said that answers had been received from some Corporations, but they were unable to give a positive answer, as, after getting the consent of the respective Councils, there had to be a town's meeting in each place. They would know more about the matter in two or three weeks. It was contemplated to go before the President of the Local Government Board on the 10th prox., when a deputation from public bodies of towns in the watershed of the Severn would be received. The Committee could take no further step without the direction of the Council as to what was to be done. To go into parliamentary opposition would require an absolute majority of the Council and a town's meeting. It would be a serious matter as to cost—it might cost several thousand pounds. The question ought not to be fought out by the Worcester people alone; the Corporations of other boroughs up and down the river ought to contribute their quota. But it appeared to him that as the Worcester navigation was involved, its salmon fisheries, its water supply, and its sanitary arrangements jeopardized, the Council, as conservators of the public interests, were bound to take some step. The Council should, he thought, to take the initiative, and it was for members to determine to what extent they would go in opposition. He did not recommend them to give the Committee unlimited licence to spend £4000 or £5000, but to take the initiative. He thought it very likely, from overtures made by Shrewsbury, that a consultation would take place between the representatives of towns whose interests were involved, as to contributing to the expense. He thought the Council should give power to the Committee to take the necessary steps for fighting the question, but at the same time leaving it to their discretion as to what extent they might be induced by circumstances to go. He concluded by moving a resolution committing the Council to oppose the Bill.

Mr. BOZWARD seconded the motion, maintaining it would be cheaper to spend £5000 in successfully opposing the Bill than to have hereafter to provide another water supply.

The TOWN CLERK suggested the addition of a few words to the resolution, limiting the expenses to be paid by the Council to those only which they incurred; and said he did not anticipate that the Committee or the Council would go to £5000 expense without from time to time considering what they were doing.

The resolution was then adopted, as were also other resolutions as to the deputation to London on Feb. 10, and authorizing the Committee to confer with representatives of other public bodies.

THE WATER SUPPLY AND SEWERAGE OF PARIS.

Under the above title, M. Alphand, the Director of Public Works in Paris, has published a series of papers of very considerable importance, not only to residents in the French capital, but to all who are engaged in the sanitary improvement of large cities. He commences by according a well-merited tribute of praise to his predecessor in office, M. Belgrand, who, he says, above all others, is entitled to the gratitude of every Parisian, for the magnificent water-works with which he provided the city, and by means of which the inhabitants have been furnished with a splendid supply of fresh spring water of superior quality. Having rendered this homage to one of the most illustrious men of his country, M. Alphand proceeds to consider the various means of improving and developing the system of water supply at present in use in Paris.

While admitting, he says, the importance of providing a city with pure and wholesome water for domestic use, it must be conceded that it is no less necessary to relieve it of that which has been rendered impure, as well as of that which falls upon the soil from the clouds. The drainage system in Paris, which 20 years ago was so defective, has now been so nearly perfected, that only a comparatively small outlay will be required, if not to complete the work, at least to finish the main sewers, which are indispensable in order to secure the streets against the risk of being flooded.

The authority having the supervision of the water and sewerage works in Paris is likewise charged with the work of clearing the house cesspools. This is one of its most difficult duties, and one, moreover, requiring the greatest care in its performance. The separation system adopted in Paris, by which the liquid portion of the excreta is allowed to pass into the sewers—thus reducing the labour of removing the nightsoil to the carrying away of a certain quantity of solid refuse—would, if properly carried out, be in every respect a vast improvement.

Having relieved Paris of her sewer waters by pouring them into the Seine, M. Belgrand had to seek some means of remedying the inconveniences resulting from such a system, by making the best he could of the effluent waters themselves. After a number of trials, which were attended with more or less success, the problem seems now to have been solved, thanks to the energy and perseverance of MM. Mille and Durand-Claye. It is very doubtful whether we have yet heard all that science

has to say on the subject of the trials these gentlemen have been conducting at Gennevilliers. As the result of experience, a number of improvements have already been discovered. The road, however, is still open, and by continuing to advance along it with firmness and prudence, the double object will be attained of removing the impossibility or danger of employing the water of the Seine for culinary purposes, and of utilizing for the public benefit the powerful fertilizing elements contained in the sewer waters of the city.

These preliminaries having been stated, M. Alphand proceeds to treat the several subjects of Water, Sewers, the Removal of Nightsoil, and the Purification and Utilization of Sewage Waters.

According to M. Belgrand, the volume of water at the disposal of the inhabitants of Paris in the year 1877 was 370,000 cubic mètres, or about 81½ million gallons per 24 hours. Of this quantity 236,000 cubic mètres, or about 52 million gallons, were obtained from the Rivers Seine and Marne and the Canal de l'Ourcq; 6000 cubic mètres, or about 1,320,000 gallons, from artesian wells; and 128,000 cubic mètres, or about 28 million gallons, from springs. In a dry year, when the want of water is most keenly felt, the total quantity supplied might be reduced to 296,000 cubic mètres, or about 65 million gallons; but in the event of an accident happening to the machinery, or to the conduits conveying the water, the city might find itself reduced to 200,000 cubic mètres, or about 44 million gallons, which would be altogether insufficient for supplying the wants of the inhabitants.

According to a statement compiled by the Engineer-in-Chief, it appears that the daily consumption of water in Paris, is now only 354,350 cubic mètres, or about 78 million gallons, apportioned as follows:—For street watering, public fountains, &c., 228,569 cubic mètres, or about 50¼ million gallons; and private consumption and waste, 125,781 cubic mètres, or about 27¾ million gallons. It is clear, therefore, that the quantity of water at present distributed in Paris is much too limited. The great work of street improvement carried out during the last quarter of a century has been the means of giving light and air to the inhabitants of the city; it now only remains to give them water in sufficient quantity, and this part of the programme is not the least important, when regarded in its relation to hygiene and the public health.

To satisfy the wants of the population and the requirements of industry it is considered that a further supply of 150,000 cubic mètres, or about 33 million gallons of water will have to be procured. Among the three sources at present available for the purpose—viz., the springs and the Rivers Seine and Marne—M. Alphand gives preference to a supply from the Seine, to be taken at a point much higher up the river than Paris, and raised by means of steam-engines of 150-horse power. He, therefore, advises the Prefect of the Seine to lay before the Municipal Council a project by MM. Couche and Humblet, which will allow of an increase in the amount of water available for distribution in Paris by something like 150,000 cubic mètres, and this in the most economical way; to call upon the Water Company to meet the Council and discuss with them the terms of a new contract having for its object the carrying out of certain measures for affording greater facilities for the use of water among the inhabitants, and the lowering of the charge to a rate proportionate to the means of small households.

The subject of water supply having been disposed of, M. Alphand turns to the sewage question. The drainage system of Paris consists first of all of the large main sewers which intersect the city, and cut it up, so to speak, into drainage areas. The sewers collect the rain and house waters, and convey them to a spot where they may be discharged with safety into the Seine, even at the time of high water. Thus Paris is relieved of her refuse waters, which would prove a source of pollution were they discharged directly into the river, and the low-lying parts of the city will be protected against floods.

The total length of sewers actually finished is 619,715 mètres, or about 380 miles. To complete the system, 420 kilomètres, or about 260 miles of additional sewers will have to be constructed. When to the outlay necessitated by these works is added the cost of improving and completing the large main sewers, and the drainage of certain quarters of the city as yet but inadequately, or even totally unprovided for, a total is arrived at of 44½ million francs, or not far short of £2,000,000 sterling.

Intimately connected with the sewage question is the subject of emptying the cesspools. The method at present employed for removing the nightsoil from the houses is the carrying away of the solid portion of the excreta in suitable conveyances, and its deposition in the receptacles provided for it outside the city. Such a system may justly be regarded as barbarous, and is altogether unworthy of a city like Paris, where such great progress has been made in almost every branch of the public service. The nauseating odour pervading the streets when the operation of emptying a cesspool is in progress, the blocking up of the thoroughfare with the necessary appliances, the disturbance caused in the night, when this work usually goes on, the infection not only of the water-closets simply, but of the entire house under treatment—all these things place the inhabitants in circumstances which are not unattended by very considerable danger to the public health. Then, again, the depositories for the reception of the excreta; these, by reason of the unbearable stench emanating from them, are a perfect pest to the localities in which they are established, and the residents have thus to tolerate a nuisance which the law may allow, but which equity should certainly put a veto upon. The complete abandonment, or an entire modification of the present system of emptying the cesspools therefore commends itself to the serious consideration of the Municipal Administration as an imperative duty devolving upon them.

M. Alphand next passes successively in review the questions of cesspools and their management; sewage receptacles and their present situation; private depositories for nightsoil; the abandonment of the present system of removal, and the substitution of one by which the refuse would flow into the drains; the processes in use for removing the solid and liquid excreta; the revenue that would be produced by imposing a tax upon all closet pipes in connection with the drains; the advantages of rendering compulsory the flowing away of the liquids, and the connection of this subject with the completion of the sewerage system. He then asks the Prefect of the Seine to make the following proposals to the Municipal Council:—

1. The establishment of the system of conveying all the liquid refuse into the sewers, and the adoption, in place of the fixed and moveable cesspools now in use, of appliances for separating the solid matter, with discharge-pipes leading into the drains.
2. That authority should be given to apply to the Government to impose a tax of 30 frs. on every such discharge-pipe.
3. That the proceeds of such tax should be specially applied to the completion of the sewerage works of the city, to the development of the use of the sewer waters for agricultural purposes, and to the general extension of the water supply in Paris.

With these recommendations M. Alphand concludes the third section of his work. In the next he deals specially with the question of sewage purification; but this, with the conclusions arrived at, will be noticed next week.

AMERICAN GASLIGHT ASSOCIATION.

[Abridged from the "Official Report" in the *American Gaslight Journal*.]

(*Continued from p.* 23.)

Mr. W. H. Pearson (Toronto, Canada) read a paper on

THE LOWE (WATER) GAS PROCESS.

At the last meeting of this Association, in reply to some statements made by a member, in a paper on "Water Gas," unfavourable to the Lowe process, I gave an account of what I had seen of its working in several places which I had visited, and expressed my conviction that the chief cause of its failure, where it had failed, was the want of proper purification. I stated, further, that the Consumers Gas Company of Toronto, of which I am the Secretary, had purchased the patent right for Toronto conditionally, and that the proprietors were about to erect two sets of apparatus in the works of the Company; and I promised that if I should be present at this meeting, I would give an account of its working there. It is in fulfilment of that promise, and in compliance with the very urgent request of the Secretary of the Association, that I now present this paper.

As Mr. Chambers, in his paper,* gave an account of the origin and progress of water gas in general, I shall confine my remarks entirely to the Lowe process. I would, before proceeding further, state that I am not in charge of the works of the Company; they being under the superintendence of Mr. Alex. Patrick, under whose supervision the works now in process of erection (hereafter referred to) are being built. I have had, however, ample opportunity of watching the working of the system in Toronto and elsewhere, and of becoming acquainted with its details, and can speak with full confidence as to the financial results.

As most of the members of the Association are doubtless aware, the Lowe gas process was invented by Mr. T. S. C. Lowe, of Norristown, Pa., and the process was patented by him in the United States in September, 1875. It was first worked upon a very small scale, by the inventor, in 1874, at Phœnixville, Pa., where the original works are still in operation, and subsequently works were erected at Conshohocken and Columbia, Pa.; Dobson's Mills, Philadelphia; Trenton, N.J.; Harrisburg, Pa.; Fort Plain, Utica, and Clyde, N.Y.; Lancaster, Pa., Indianopolis, Ind.; Baltimore, Md.; Scranton and Wilkesbarre, Pa.; Newburgh, N.Y.; and Kingston, Brockville, and Toronto, Ca. It will thus be seen that the process has made considerable headway since its introduction at Phœnixville five and a half years ago, and with the exception of Trenton and Harrisburg, where the gas was not purified, most of the above Companies have, in a published statement, expressed high satisfaction with the process.

The apparatus consists of oil storing and distributing tanks, a generator, superheater, wash-box, scrubber, condenser, hydraulic main, and multitubular condenser, boiler, and blower. The oil-distributing tank is placed above the working gallery, and has tubes at the bottom to convey the oil to the generator. The generator is the chamber in which the gas is made. It is a cupola made of boiler plate, lined with fire-blocks. It has an opening at the top with a cover, which is clamped down during the process of "blowing up" and gas-making. There is a grate at the bottom, with an open space below, through which it is blown up by the air-blast. A pipe is inserted a short distance above this space, through which the steam is forced during the process of gas-making. A pipe from near the top of the generator conveys the gas to near the bottom of the superheater. The superheater, where the gas is "fixed," is also a boiler-plate cupola, lined in the same manner as the generator. It is generally from one-third to one-half higher than the generator, and one-fifth less in diameter. There is an arched air space in the bottom, the arch being perforated. Above this space, and nearly up to the gas outlet at the top, fire-bricks are placed in layers, with spaces of about two inches between them. It has an opening at the top, communicating with the smoke-stack, which is left open during "blowing up," and is closed with a valve during gas-making. Another pipe from near the top of the superheater conveys the gas to the wash-box, and an air-blast pipe enters the bottom of the superheater near the pipe connecting it with the generator. The wash-box is an oblong boiler-plate box, square on three sides and rounded at the bottom. A perforated boiler-plate diaphragm is placed across about one-half of the box, for the purpose of breaking up and more thoroughly washing the gas. The wash-box is about three parts filled with water, and the gas from the superheater is conveyed by a pipe which passes through the top at the end nearest the superheater, to a sufficient depth in the water to seal the gas. The tar is run off from the bottom into a well. The gas passes from the top of the wash-box to the bottom of the scrubber. The scrubbers, of which there are two for each set, are a little higher than the generator, and about three-fifths of its diameter, and are also made of boiler plates. They are similar to the ordinary scrubbers of coal gas-works, and need no further description. The gas is passed from the wash-box to the bottom of the first scrubber, from the top of the first through the top of the second, then down through the hydraulic main, from thence to the bottom of the multitubular condenser, and from the top of the condenser to the main leading to the purifiers; from thence to the meter, and to the holder. The multitubular condenser, also made of boiler-plate, is only used when the works consist of two or more sets of apparatus, and is generally placed in the centre of the scrubbers. Being similar to that used in coal gas-works, it need not be described.

The valve from the superheater to the smoke-stack being open, and its gas outlet being closed, the generator is kindled through the door at its base, charged with anthracite of large egg size through the top, and then closed and fired up by an air-blast entering below the grate. The gases formed by combustion in the generator—viz., nitrogen and carbonic acid—are driven out of it through the pipe to the chamber at the base of the superheater, where, meeting an air-blast, they ignite and flame up through the loose mass of fire-brick, evolving so intense a heat that, by the time the coal reaches a cherry red, this will stand at a white heat, which is the proper condition for gas-making. The air-blast is then shut off, the valve at the top of the superheater is closed, and at the same time steam (preferably superheated) is admitted a little below the grate-bars of the generator, and, by contact with the incandescent fuel, is decomposed, forming hydrogen and carbonic oxide. Simultaneously small streams of crude petroleum are dropped through the ascending gases directly upon the red-hot coal. The hydrocarbons thus released pass, together with the water gas, to the bottom of the superheater, rushing upward among the white-hot bricks therein to the outlet, by means of which they escape to the washer. Of course, the continuous passage of steam through the coal gradually reduces its heat, and when this falls below a certain point the gas-making is stopped, a small quantity of coal is thrown into the generator, and the blast is applied again until the heat is sufficiently restored. When the amount of gas required is considerable, two or more sets of apparatus are employed and used alternately—that is, one is running gas while the other apparatus is re-firing, thus securing a continuous production of gas.

It will thus be seen that the distinctive feature of the Lowe process is the introduction of petroleum or other hydrocarbons to the incandescent coal in the production of the divers gases simultaneously in the same

* See Journal, Vol. XXXII., p. 931.

chamber, and this is claimed to be one of its chief advantages, inasmuch as it prevents that waste of heat which takes place when it is applied externally, as in other gas processes.

As I gave an account of the introduction of the process at Toronto, at the last meeting of this Association, it will not be necessary for me to go over the same ground again. Two sets of apparatus, of sufficient capacity to produce 150,000 cubic feet per diem, were at that time in process of construction for the proprietors of the patent. They were not completed, however, until February last. Gas was first made on Feb. 9, and on March 1 the works went into full operation; and up to Sept 30 last 26,641,000 cubic feet of gas had been produced.

In the following table I have not considered it necessary to give the prices of materials and expense of labour, as these vary in different places, and it could be of no practical benefit. Each on can make up the cost for himself at the prices prevailing at the place where his works are located.

Average Results for Seven Months.

Year 1879.	Average Production per Diem, when Works were Running Full Time.	Average Number of Charges per Diem.	Average Production per Charge.	Average Materials Used per 1000 Feet, working Whole Time.			Gas Purified per Bushel of Lime.	No. of Men Employed in 24 Hours.
				Crude Petroleum.	Anthracite Coal in Generator.	Coke for Boiler.		
	Cubic Feet.		Cub. Ft.	Gallons.	Pounds.	Bushels.	Cub. Ft.	
March .	153,000	38	4037	4·46	54·91	·18	16,610	‡7
April...	166,900	41	4066	4·11	53·17	·11	8,910	7
May ...	155,000	39	3604	4·18	52·48	·18	11,630	7
June*..	129,000	34	3794	4·09	62·46	·22	11,050	7
July* ..	107,000	33	3242	4·14	68·91	+·36	9,700	7
August.	162,000	35	4674	4·08	58·91	·38	13,960	7
Sept....	143,000	36	4527	4·04	59·09	·38	13,160	7
Average	148,000	36·56	3992	4·15	58·56	·26	10,717	7

On eleven occasions 190,000 feet and upward per day were made, and on one occasion 210,000 feet.

* During these months a number of samples of coal were tested, some of which were very inferior. There was also a partial stoppage in the supply through the fusion of the bricks and deposition of carbon immediately over the arches in the superheaters.

† Discontinued burning tar after four months.

‡ Comprising one engineer, one oil-man for gallery, one stoker for ground floor, and one labourer in the daytime. The same force at night, with the exception of the labourer.

Until February all the gas made was from coal, about 8 per cent. of cannel being used. In February only about 6 per cent. of Lowe gas was made. After April 4 no cannel was used except on Sundays, when no Lowe gas was made. After February the following quantities were made:—

March,	Lowe gas,	3,837,000;	coal gas,	8,250,000;	total gas made,	12,087,000.
April,	„	4,493,000;	„	5,367,000;	„	„	9,860,000.
May,	„	4,188,009;	„	4,076,000;	„	„	8,264,000.
June,	„	3,096,000;	„	3,809,000;	„	„	6,905,000.

In the months during which the largest proportion of Lowe gas was made the quantity of sulphur found was very much less than the average, the ammonia considerably less, and no sulphuretted hydrogen at all was detected; while the average illuminating power during the time when Lowe gas was made, when no cannel was used, was equal to that of the coal gas enriched by cannel. As the average candle power from April to June was 15·15 (the candle power of the coal gas without cannel being under 14 candles), and as less than half of the gas made was Lowe gas, it is fair to assume that the illuminating power of the Lowe gas was over 16 candles. Tests of this gas taken separately by a Sugg Illuminating Power Meter showed between 16 and 17 candles, and daily tests, taken by the same apparatus, of the mixed gases averaged from 15½ to 16 candles. It has also been demonstrated that the illuminating power of the gas can be kept at nearly the same figure.

No difficulty of any importance was experienced until the works had been in operation over three months, when a gradually diminishing yield gave warning that something was wrong, and a careful examination resulted in the discovery that the loose bricks in the superheaters immediately over the arch had fused together to such an extent as to stop the free flow of the gas. Two or three days, however, were sufficient to remove and replace them, and one day would have been enough, had it not been necessary to wait until the superheaters cooled. As the quantity of bricks destroyed was only about 200, the expenditure was not great.

This difficulty was unexpected, as we had not then heard of its having taken place elsewhere; but we have learned since that similar trouble has arisen in other works, and we think it will be necessary to have the superheaters examined every three or four months.

In our opinion, a larger amount of purification is required than for coal gas. The cost per 1000 feet, including labour, with lime at 22 cents per bushel, amounts to about 3½ cents; and, owing to the great rapidity with which gas is made, larger purifiers are required than would be needed in coal gas-works, where the same quantity of gas is produced per diem. It has also been found necessary to use lime exclusively for purification.

Men of greater intelligence are needed than answer for stokers in coal gas-works—more care, watchfulness, and judgment being required.

Owing to the character of the petroleum used, it is found necessary to steam out the wash-boxes for about half an hour each day; but as this is done while the fires are being raked down, no time is lost. Where naphtha is used, it is not necessary to do this. It is also desirable to steam out the scrubbers two or three times a week for a few minutes.

We have had but one stoppage in the pipes in the works after purification of the gas, and that was in the pipe between the purifiers and the station-meter, which was partially clogged with naphthaline, but not to a greater extent than has been the case with our coal gas.

There have been no stoppages in the mains outside of the works. A few service-pipes have been partially obstructed with naphthaline, but not more than in former years. We have had no complaints of the stoppages of burners.

A large amount of tar is produced, and we are now having an analysis made for the purpose of ascertaining its value.

The advantages of the process, as compared with coal gas manufacture, may be summed up as follows:—

1. The great saving in the cost of labour. In works where two sets of apparatus are used, seven men can produce an average of 150,000 feet per diem, and in large works the same number of men can work three sets, and produce 225,000 feet per diem. In Baltimore they claim that twelve men can work eight sets—six men in the day and six in the night.

2. The small amount of wear and tear as compared with the retort system.

3. The comparatively small amount of storeage room required where all the coal needed for the year has to be laid in in the summer. One ton of coal being sufficient to make 34,000 feet of gas, not much more than one-quarter of the room is needed.

4. The saving in interest in not having to purchase so much material in advance—the petroleum being obtainable as wanted.

5. The rapidity with which gas can be made in cases of emergency. In Toronto, as stated, 200,000 feet per diem were made, and in Baltimore I am informed that 600,000 feet have been made in eight sets of apparatus during the night.

6. The heats can be let down at any time without injury to the apparatus; consequently work can be stopped on Sundays. Gas can be made within four hours from the time the fires are lighted in the generators, and it has been done in two hours at our works.

The Directors of the Company were so well satisfied with the general working of the process and the results obtained, that in July last they completed the purchase of the patent rights for Toronto, paid the proprietors for the works they had erected, took them off their hands, and decided upon erecting five additional sets of apparatus, another purifying-house, additional purifiers, and a station-meter. The work is now far advanced, and the whole is expected to be completed before the close of the year. These apparatus, with the others erected, will have together a capacity of over 500,000 cubic feet per diem.

Situated, as we are in Toronto, with anthracite coal a little cheaper than bituminous, and petroleum at a moderate price, we find it considerably to our advantage financially to make gas by the Lowe process—so much so, that we felt justified in reducing the net price of our gas on the 1st of October from 2 dols. and 1·75 dols. to 1·75 dols. and 1·50 dols. per 1000 cubic feet; and unless anthracite and petroleum advance and bituminous coal decline very considerably, we shall make by far the largest proportion of our gas by the new method; and probably should make the whole, were it not that the works now nearly completed will not be of sufficient capacity to supply the rapidly-increasing demand.

Mr. Helme said Mr. Pearson had omitted to state anything about carbonic oxide. This had often been a mooted question in connection with the Lowe process of making water gas, and he should have been glad of some information on the point. He asked if an exact record of the quantity of carbonic oxide obtained per 1000 feet of gas made had been kept by Mr. Pearson.

Mr. Pearson said he had not such a record, as the gas had not been analyzed.

Mr. Littlehales asked whether the gases were measured separately, or when mixed; also the difference in cost between the two gases.

Mr. Pearson said they were measured separately; and, as stated in his paper, the difference in cost was about 15 cents per 1000 feet—that was leaving the cost of the plant out of question.

Mr. Littlehales said it would make a considerable difference if the interest on the cost of the plant, patent rights, &c., were added. What he wanted to get at was what the commercial advantage was over coal gas.

Mr. Pearson replied that there was a considerable saving in the matter of coal; besides, if he had not used the process described, he would have had to erect more coal-sheds and have purchased additional property. He thus saved the interest on the outlay which otherwise would have been necessary.

Mr. Littlehales submitted that this was scarcely an answer to his question. What he wanted to know was this: The amount per 1000 feet for patent rights, and the cost of the plant, with interest added at, say, 8 per cent., compared with the reduced cost as stated in the paper, and what was the commercial advantage in making gas by the Lowe process over the coal process. This was the most important consideration in the whole thing.

Mr. Pearson said he could not answer this. He asked the Association to bear in mind that they had only commenced the use of the process last spring, and that they were running the two systems together side by side. They were now erecting larger works; and, after a year's experience in the manufacture of gas by the Lowe process, he would be able to give satisfactory data.

Mr. Denniston asked if the expense of purification were included in the estimate.

Mr. Pearson said it was. When speaking of saving 14 or 15 cents per 1000 feet by making gas under the Lowe process, he estimated for all expenses of putting the gas into the holders, including purification.

Mr. Littlehales inquired if this included the cost of plant and the patent rights.

Mr. Pearson stated that it included materials and labour only.

Mr. Littlehales asked Mr. Pearson how much gas he made from coal under his coal gas process—how much per retort and per man—as these were important points bearing upon the comparative cost.

Mr. Pearson said they made 9400 or 9600 feet per ton (2000 lbs.) of coal; 34,000 or 35,000 feet a day per bench of sixes—two men being required, one for the day and one for the night; size of retorts, 9 feet by 21 in. by 14 in. That showed per man per day about 18,000 feet of gas from Youghiogheny coal.

Mr. Dwight said his make of gas averaged during the past year 42,000 feet to the bench of sixes—9 feet long by 14 in. by 26 in. For a week he had made more than 50,000 feet per bench. He used the same kind of coal as Mr. Pearson, and the illuminating power of the gas was from 16 to 17 candles all the time.

Mr. Cartwright had heard some of the criticisms of the Lowe process, and he should like to ask Mr. Pearson if he had made photometrical observations during the progress of the charge.

Mr. Pearson said he had, and found the gas vary, between the first of the charge and the last, probably from 22 down to (say) 20, and even to 10 candles. There was great variation between the first gas and the gas made later on; but the quality supplied to the city was uniform—there was no variation after the gas left the holder.

Mr. Cartwright asked what had been the experience with the consumers. Had any difference, as far as they were concerned, been found between the old and new processes?

Mr. Pearson replied that there had been some complaints, but not more than in ordinary cases. In every instance in which they had investigated complaints it had been found that the cause was the defective burners used, or a partial stoppage of the pipes.

Mr. Harbison questioned the accuracy of the figures adduced as to the cost of purification, which he maintained should have been stated at 5½ not 3½ cents per 1000 feet.

Mr. Sherman asked if the mains had had to be enlarged consequent upon the change of supply from coal gas to water gas.

Mr. Pearson said they had been enlarged on account of increased consumption; but not consequent upon the change of supply. In answer to further questions, he said they had not made any change in the burners, but kept the distributing pressure a little higher. He had not made up the leakage account for the last two or three months, and so could not state the loss in this way. They sent the gas by the two processes to the same holder, the gases being mixed in the proportion of one-half or two-thirds coal gas. The holders were exposed to the atmosphere.

Mr. Harbison said he understood Mr. Pearson to state, in answer to Mr. Cartwright's questions, that the quality of the gas varied during the charge from about 22 to 10 candles; also that the gas became mixed with

the other gases in passing into the holder. He (Mr. Harbison) would like to inquire whether the variation of the temperature had been such as to affect it; and, if not, whether a very radical change of temperature on the same day would affect it. What would be the effect upon the gas in the holder if the thermometer should fall 40° within a few hours, as it sometimes did?

Mr. Pearson said he could not answer this question. As he had stated before, they had only been making gas by the Lowe process since last spring, and had been making it in connection with coal gas. He had given, in the paper, all the facts and all the data he had been able to gather from personal experience and observation of the use of this process of making gas since it was introduced at their works. They had not been making it for a sufficient length of time, and had not been making it in such a way as to enable him to give the most precise and definite information. They were now enlarging the works, with a view of making gas by the process on a larger scale, and after the experience of the coming year he might be able, at the next annual meeting of the Association, to give detailed and precise answers to any questions that would be asked.

Mr. M'Elroy asked, in regard to the naphthaline to which the author of the paper had referred, what kind of weather there was at the time of its formation.

Mr. Pearson said it was pretty warm weather.

Mr. C. A. White did not see how there could be any naphthaline in oil gas. He had always supposed that crude petroleum vaporized was the very best thing possible to be used to clean naphthaline out of the pipes. He could not conceive of any situation or condition of things which would permit of the existence of naphthaline in oil gas-works, and asked Mr. Pearson if he examined the substance carefully to know that it was naphthaline, or if it was lampblack, or an excess of carbon carried over.

Mr. Pearson said it was a very hard substance, and they concluded that it was naphthaline. It was of a brownish colour. They had had similar deposits from the coal gas-works.

Mr. White thought that it must certainly have been the carbon carried over.

Major Dresser was on Mr. Pearson's side upon this question of naphthaline in oil gas-works, because he had it from the very best authority that works making gas exclusively by the decomposition of steam by incandescent carbon, and the introduction of petroleum oil or naphtha for illuminating purposes, had very serious trouble with naphthaline, so much so that they had been obliged to stop work until they could clean out the pipes. This same difficulty had been experienced by a certain company in New York, and it was a very serious inconvenience at times. He confessed it did seem to be a singular thing, and from the experience they had previously had of naphthaline, it seemed incredible; but he had had it from the most excellent authority that the thing did actually exist, and he believed the man who told him of it knew what naphthaline was.

Mr. M'Cauley asked if they had found any difficulty in running the generators; as he had. Their bricks became carbonized, and would not give out the heat.

Mr. Pearson said he did not find any difficulty of this kind. They had found that there was a slight deposit of carbon on the bricks; also that the bricks ran into each other, and they were obliged to take them out and put in new ones. They had only lost about 200 bricks in the two generators.

Mr. Slater said they had been asking Mr. Pearson a great many questions, but it seemed to him that he was hardly in a position to answer them satisfactorily, either to themselves or to himself. The questions that had been asked were those that called for very precise and detailed information, which Mr. Pearson's present experience in the use of the Lowe process did not enable him to answer in a perfectly satisfactory manner. He had stated that he was making by the Lowe process one-third of the gas which he sent out, and two-thirds by the coal-gas process. He had also stated that he did not begin to use the Lowe gas process really until the beginning of March last. It seemed to him, therefore, that he could not be expected, with the experience he had thus far had, to answer every question that might be asked, or to meet every suggestion as it was made. His Company proposed to erect additional buildings, and continue the use of the Lowe process on a much more extended scale. If these works were put in operation during this year, Mr. Pearson would have abundant opportunity to enlarge his experience and his knowledge in relation to the practical working of the process, and he would undoubtedly be able, at the next annual meeting of the Association, to furnish the members with information of the most minute and satisfactory character. As the matter now stood, however, he did not think they could reasonably or fairly expect Mr. Pearson to answer all the questions that had been propounded. He had prepared and read a most able and interesting paper, which embodied all the facts in relation to the Lowe process that he had been able to gather from his personal experience and observation during the time the process had been in operation at his works. He could, at the present time, do nothing more than reiterate the statements he had made, and it therefore seemed to him (Mr. Slater) that the question had better be left where it now stood until Mr. Pearson, after a more enlarged experience and more extended observation, should be able to give the information which it was not now in his power to furnish.

Mr. M'Ilhenny inquired whether Mr. Pearson had made any calculations as to what the result would be if all the companies in the United States made gas from oil; because, if the process was so much superior, as Mr. Pearson evidently thought it was, all the companies in the country would adopt it. He (Mr. M'Ilhenny) thought Mr. Pearson had given a very fair and impartial statement. He had stated the cost upon both sides, so that it was easy to calculate the advantage. He had told how much labour and material it took to make 1000 feet of both kinds of gas; and he thought the Association was under many obligations to him for the clear and explicit manner in which he had stated the facts. He would, however, like to ask whether, owing to its great superiority and cheapness, he anticipated the universal use of petroleum for making gas; and, if so, whether he had calculated what the commercial effect upon the market would be.

Mr. Pearson did not anticipate that it would be universally used in the United States, but he thought it would be in Canada. If it was, they had such an abundant supply of petroleum that all the gas companies could use it, and such use would have very little effect upon the market price of the oil.

A vote of thanks was then passed to Mr. Pearson for his paper, and for the answers given by him to the questions propounded. He was also requested to continue his observations, and report upon them at the next annual meeting.

(To be continued.)

Transfer of the Derby Water-Works to the Corporation.—The undertaking of the Derby Water-Works Company was transferred to the Corporation on the 1st inst., in accordance with the provisions of the Derby Improvement Act, 1879. The purchase-money agreed upon was £308,000.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There has been rather a dull tone in the Lancashire coal trade since the commencement of the year. The open weather has naturally had an effect upon the demand for the better classes of round coal suitable for house-fire purposes, and as the new year holidays have recently caused partial stoppages at many of the local works, there has been rather less inquiry for manufacturing classes of fuel. There is, however, a very fair demand for forge coal, which has a tendency to advance in price, and the improved shipping demand for steam coal is also contributing to the enhanced value of the lower classes of round coal. Burgy is still only in poor demand, and this is a class of fuel which is practically going out of the market, users of burgy now generally falling upon slack, which is more adapted to the improved furnace appliances in use. Slack, as a consequence, is moving off more freely; but although there are some collieries which are fully sold, the supplies of this class of cheap fuel are generally tolerably plentiful in the market. So far as prices are concerned, there is no very material change since last week, any general advance being effectually checked by the large quantity of coal that is being offered in the market. The average quotations at the pit mouth are about as under:—Best round coal, 8s. 6d. to 9s.; seconds, 6s. 6d. to 7s.; common house coal, 5s. 6d. to 6s.; steam and forge coal, 5s. to 5s. 6d.; burgy, 3s. 9d. to 4s. 3d.; good slack, 2s. 9d. to 3s. 3d.; and common, 2s. to 2s. 6d. per ton.

The wages question in the coal trade is still unsettled. Some of the notices expire this week, and it seems doubtful what course the men will take; but the masters are, apparently, determined not to give way.

There is a good demand for coke, and better prices are obtained.

The iron market continues very firm, with steadily advancing prices. Makers have very little iron to offer for anything like prompt delivery, and although local consumers are not, with the exception of forge proprietors, large buyers at present, there is a considerable inquiry from merchants for delivery over the second quarter of next year, but the prices asked by makers tend to check much actual buying just now. For Lancashire pig iron the quotations at present are little more than nominal, but for delivery into the Manchester district orders could not now be placed at less than about 67s. 6d. to 68s. per ton, less 2½ for both foundry and forge qualities. In the finished iron trade prices are also very stiff, and considerable orders are coming into this district from America for bars and light rails. For Lancashire bars, delivered into the Manchester district, most of the makers are very firm, at from £8 10s. to £9 per ton, although there are some cases where makers are waiting for specifications. Orders for prompt delivery could be placed at about £8 5s. per ton. Founders, however, are not yet able, notwithstanding the increased cost of the raw material, to obtain very much better price for their castings, and pipes are being delivered into Lancashire at less than £5 per ton.

Following Mr. Chamberlain's award in Staffordshire, an advance in wages is being granted, by the employers, to the finished iron workers in Lancashire.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The main feature of interest in connection with the coal trade of the North is the increasing local demand for inferior coals. The iron manufactories, the iron shipbuilding yards, the chemical works, and other local industries on the Tyne and adjacent ports, are getting into full employment, with a prospect of better business further on in the year, and the local consumption of fuel is increasing considerably. The demand for coke for home use and for shipment is likewise strong, 16s. 6d. per ton being the last quotation. Makers are not disposed to do business more than a fortnight ahead at that price. The shipments of gas coals by the regular boats do not alter very much. The recent stormy weather put several steamers out of time, but a week of tranquil seas and moderate winds, and, above all, an absence of fogs, has enabled them to get into their regular way again. Most of the small sailing vessels which were taken up to load coals last week—and these were not many—were for the gas-works in the towns on the English Channel. Freights were easier; the following rates being paid:—Poole, Folkestone, and Cowes, 7s. per ton, with other ports in proportion. As low as 4s. per ton has been taken by steamers to load coals for London.

The manufacturing iron trade on the Tyne has not been so busy in the past four years as it is at present. The large factories of Messrs. Hawks, Crawshay, and Co., and of Messrs. John Abbot and Co., Limited, at Gateshead, are so full of work that the former have been obliged to decline to take some large orders. The ironfoundries on the Tyne are in a similar favourable position. The price of manufactured iron is very much higher than what it was two months ago. It is believed in the North of England that the present prices will be fully upheld over 1880. There is a good demand for gas and water pipes, and large quantities of drainage pipes continue to be despatched from the Tyne to the principal cities of Northern Europe.

The position of the chemical trade has very much improved. There are extensive inquiries in the market for chemicals to be sent abroad in the latter part of February and the whole of March. Much higher rates are offered for March than for January and February shipments. The stocks of chemicals are low at the manufactories. Makers hold out for higher prices for this year's business, and they are in no hurry to bind themselves down with contracts until they can see the tendency of trade.

Some large orders for fire-bricks were booked last week. The price of this class of goods is very much higher than it was this time last year. Cement, too, and other articles of that description, are in improved demand. The shipments to the Continent are likely to be large throughout this year.

According to the advices received in Newcastle-on-Tyne from correspondents on the Continent, the Belgian and German iron business promises to be equally as flourishing as our own. Most of the foreign manufacturers are well off for orders.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

Some time ago the Banchory Gaslight Company, which has been in existence for the last 25 years, resolved to take advantage of the Companies Act, and have itself registered and incorporated as a limited liability Company. This has now been done, and the first meeting of the Company, as now constituted, was held last Tuesday, when the following gentlemen were elected Directors:—Messrs. Gilbert Sadler, Geo. Merson, George Craigmile, James Scrogie, Alexander Black, and William Lindsay. Mr. Sadler was unanimously elected Chairman.

At a meeting of the Partick, Hillhead, and Maryhill Gas Company, Limited, held on Friday, it was unanimously agreed to forego interest upon their claims against the City of Glasgow Bank, whose disastrous failure occurred about 15 months ago. The liquidation of the ill-fated corporation is now rapidly progressing towards a close.

When speaking, in last week's "Notes," of the Dundee Gas Commission's affairs for the past year, I omitted to mention that the annual statistics bearing upon the revenue, expenditure, and debt of the public corporations of the town contained the following figures in respect to

the Gas Commission:—Revenue, £57,985 18s. 6d.; expenditure, including interest and sinking-fund on debt, £58,282 7s. 6d.; debt, £116,447 10s. The last-mentioned item includes annuities, not capitalized, to the extent of £8337 4s. 6d. Before leaving Dundee gas affairs, I may mention that at the usual monthly meeting of the Gas Commissioners, held during the past week, Provost Brownlee, who presided, introduced the question of the Tay Bridge Disaster Fund; and inasmuch as some of the servants of the Commission had lost their lives by the disaster, he moved that the Board contribute a donation of £50 to the relief-fund. The motion was seconded by Councillor Drummond, and at once unanimously agreed to. Besides the two workmen named last week, who were passengers by the ill-fated train, there was another victim closely connected with the Gas Commission, in the person of a son of one of the gas inspectors. There appeared to be some doubt in the minds of the Commissioners as to their power to subscribe to such a fund, and the Clerk told them they had no power, but that they did many things without power. The Provost got over the difficulty by saying that financially the Corporation in a first-class condition.

An indication was recently given by one or more members of the Town Council of Inverkeithing to take over the gas supply of the town, under the provisions of the Burghs Gas Supply (Scotland) Act, and notice of motion to that effect was given by Councillor M'Donald. However, at a special meeting of the Council, held last Wednesday, that gentleman announced that his views on the subject had been somewhat modified, owing to the circumstance that the Gas Company had agreed to reduce the price of the gas supplied by them to the public, to which the Provost replied that the resolution of the Gas Company was that a reduction in the price of gas should only be allowed to such consumers as paid for their supply within a month from the date of survey. Another member of the Council directed attention to the fact that the Magistrates were either Directors or Shareholders of the Gas Company, and that consequently they had the whole matter in their own hands. Mr. M'Donald subsequently gave notice of a motion to the effect that the Town Clerk should be instructed to ask the Gas Company whether they would be prepared to grant the Council a discount on the cost of gas supplied to them, and that in the event of the Company refusing to do so the Council should consider the propriety of purchasing the works.

A meeting of the Local Authority of the burgh of Irvine and the Committee of the Dundonald Parochial Board, as Water Commissioners, was held last Wednesday, when there was submitted a report from Mr. Gale, C.E., Glasgow, as to a supply of water to Kilwinning. The report recommended the Kilwinning Local Authority to throw in their lot with Irvine, and share their assessment; failing that, to try and get a supply by meter from the Irvine works as near 3½d. per 1000 gallons as possible.

At a meeting of the Town Council of Kilmarnock, held last Wednesday, the report from the Gas Committee was submitted, in which the Manager stated that since the pressure was reduced he had tested it at 22 places, principally at the extremities of the burgh, and had found the maximum to be 2·1 inches; minimum, 1 inch; and the average, 1·6 inches. The Committee agreed to keep the initial pressure at the present point. Gas sold for November, 1878, 4,845,650 cubic feet; value, £1110 9s. 2½d. Gas sold for November, 1879, 4,194,300 cubic feet; value, £961 3s. 10½d. Illuminating power, maximum, 29·8; minimum, 28·1; average, 28·4 candles. Mr. Brown said the Committee had found that the saving of coal, wages, &c., nearly balanced the loss they had sustained in the revenue.

As might be expected, the stoppage of the water supply to Newport by the destruction of the Tay Bridge is causing a great amount of trouble and disappointment to a large number of the inhabitants of that important Fifeshire suburb of Dundee. As many as 30 pumps are said to have been taken up in one locality, and great expense will be incurred in restoring the former fittings; but the worst is the apprehension of a serious scarcity whenever a season of drought occurs. Various suggestions are made by way of meeting the difficulty which has unfortunately occurred, and the Water Committees of Dundee and Newport and the Trustees of Tayfield Estate are being urgently advised to lose no time in coming to an understanding on the subject.

The Glasgow pig iron warrant market was exceedingly strong all last week, and an immense amount of business was done at rapidly advancing prices. As high as 71s. 7½d. cash was paid on Friday afternoon, but at the close the prices for sellers were 71s. and 71s. 6d. one month; buyers offering 1½d. per ton less.

Since the close of the holidays there have been evidences of peaceful counsels prevailing on the part of the coalmasters and miners, who have for some time been at war; but, on the whole, the coal trade is pretty quiet, there being nothing pressing in the shape of shipping orders.

Halstead Gas Company, Limited.—A Company with this title was registered on the 2nd inst., with a capital of £10,000, in £10 shares, and proposes to acquire the existing works for supplying gas to the town and parish of Halstead, Essex.

Reading Water Supply.—At the meeting of the Reading Town Council last Thursday, it was reported by the Borough Accountant (Mr. R. Bradley) that the clear profits of the works for the last half year, after carrying to the interest and sinking-fund account the sum of £1375, would be more than sufficient to pay the full annuities in respect of the half year.

Sale of Shares in the Barnsley Gas Company.—On Wednesday last, Messrs. Lancaster and Sons offered for sale 12 D shares, entitled to 7 per cent., and some original 10 per cent. stock in the above-named Company. The shares realized £14 15s. each, £100 worth of the original stock sold for £205, and £200 worth for £413; the remainder, amounting to £111 16s. 9d., fetching as much as £231.

Cardiff Water-Works Company.—An extraordinary meeting of this Company was held last Tuesday—Mr. Griffith Phillips in the chair—to give the authority of the Shareholders to the Bill now being promoted in Parliament by the Directors of the Company, for the due appropriation of the surplus capital left after paying the Shareholders £200 per cent., as agreed upon. The promotion of the Bill was unanimously agreed to.

Staveley Gaslight Company.—This Company, which was provisionally incorporated under the 7 & 8 Vict., c. 110, on April 1, 1856, and completely registered by the filing of a deed of settlement on the 22nd of July of that year, was constituted a limited company under the Acts of 1862 and 1867 on the 1st inst., in accordance with a resolution passed by the Shareholders at a general meeting held on the 30th ult. The capital is £3000, in 300 shares of £10 each; 150 of the shares being fully paid, and £6 per share having been paid on the remainder.

Hull Lighting Bill.—On Saturday, the 3rd inst., a meeting of the Parliamentary Committee of the Hull Corporation was held, when the Town Clerk reported the steps he had taken with reference to the above-named Bill, and produced a copy of the Bill, which he said was framed upon the Liverpool Corporation Act of last session. In the Liverpool Act, however, five years were asked for in which to make experiments; but in the Hull Bill he had inserted a clause to allow ten years. On the motion of the Chairman (Alderman Waller), seconded by Mr. Elam, the Bill was approved.

Singular Death from Suffocation by Gas.—On Saturday last an inquest was held at Stockport on the body of Elizabeth Doyle, a domestic servant, aged 28, a native of Blackburn. Last Monday she entered the service of a Miss Goodall, of Southport, and not coming down at the appointed time on Friday morning, her door was opened, when she was found lying insensible on the bed, having been suffocated by gas. One of the bed-posts had broken through the flooring and fractured a gas-pipe, the result being that the gas escaped into the room and was inhaled by the young woman, who remained insensible until Saturday morning, when she expired. A verdict of "Accidental death" was returned, and it was remarked that no blame attached to anybody.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

17.—Jensen, P., Chancery Lane, London, "Improvements in and connected with steam and water jet motors, partly applicable to fluid-meters." A communication. Jan. 2, 1880.

56.—Woodward, J., Manchester, "Improvements in arrangements and apparatus to be used in the working of gas-purifiers. Jan. 7, 1880.

62.—Silber, A. M., Whitecross Street, London, "Improvements in lamp or gas stoves." Jan. 7, 1880.

83.—Vale, J. H., Hamburg, Germany, "Improvements in apparatus for enriching gas." Jan. 8, 1880.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

2756.—Harrison, F. J., Queen Victoria Street, London, "Improvements in gas-burners for increasing the illuminating power of gas." July 7, 1879.

3745.—Kitt, B., Bristol, "Improvements in gas-lamps." Sept. 18, 1879.

4290.—Smith, G., Shepherd's Bush Common, London, "Improvements in the apparatus for the manufacture of gas and machinery used for charging receptacles for the same, whether on railway carriages or elsewhere." Oct. 22, 1879.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

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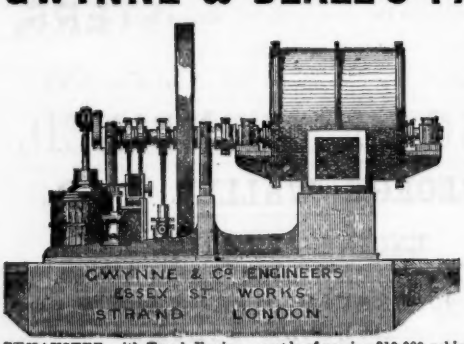
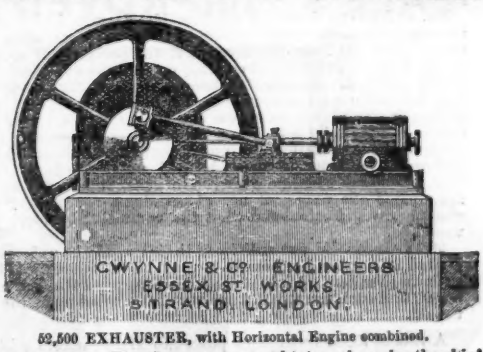


EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

WANTED, Readers of the NEW Edition, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.

WANTED, a Situation as Foreman or INSPECTOR of Water-Works, by a thoroughly experienced man, well up in the Distribution of Water and management of men. No objection to go abroad. Address FOREMAN, 3, Fountain Rd., LOWER TOOTING, S.W.

WANTED, by a young Married Man, a Situation as WORKING MANAGER of a small Gas-Works. Good references. Address No. 618, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a respectable Married Man, a Situation as Manager in a small Gas-Works. Thoroughly understands the Making and Distribution of Gas, Gas-Fitting, and Main and Service Laying. Good references. Apply to ROBERT AINSLEY, 32, John Street, West Pelton, by Chester-le-Street, DURHAM.

WANTED, by an Energetic Man, aged 37, a Re-engagement as MANAGER of medium-sized Gas-Works, or as SECRETARY and MANAGER of a small Works, at home or abroad. 18 years practical experience. Is a first-class Carbonizer. Excellent testimonials. Address No. 617, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, an Engagement as Engineer or MANAGER of a country Gas-Works, or ASSISTANT in a large town. Is conversant with all matters appertaining to Manufacture and Distribution. Can design works. Has had 25 years experience as Draughtsman, Manager, and Engineer. Address No. 614, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

LOUGHBOROUGH GAS COMPANY.

WANTED by the above Company, a CLERK who has been accustomed to the routine of a Gas Office. The person appointed will be required to assist in the Taking of the Meters, and likewise the Collecting of the Gas Accounts. Office hours from 9 a.m. to 6 p.m. Salary £50 per annum.

Applications to be sent in to me by Monday, the 26th of the present month.

J. B. BALL, A.I.C.E., Manager.

Jan. 12, 1880.

TO GAS-FITTERS AND PIPE-LAYERS, &c.

THE Bangor Water and Gas Committee require a competent GAS-FITTER and PIPE LAYER, &c. Wages 30s. per week.

Applications, in own handwriting, together with copies of last testimonials as to character, abilities, &c., to be addressed, not later than the 26th inst., to the undersigned.

DAVID WHITE, Secretary and Manager.

WATER-WORKS—Assistant-Manager required. Must possess a Knowledge of Civil and Mechanical Engineering; also of the Principles of Water-Works; and will be required to reside in the district supplied by the Company.

Applications, in writing only, stating age, references, last or current employment, and salary required, to be addressed to the SECRETARY, West Surrey Water Company, No. 110, Cannon Street, LONDON, E.C.

TO GAS ENGINEERS.

THE Directors of the Sheffield United Gaslight Company require the services of a Resident ENGINEER. The requisite qualifications are a thorough Practical Knowledge of Engineering, Preparation of Plans, and Construction of Works; the Manufacture and Distribution of Gas; and of Chemistry as applied to its Manufacture and Purification; also of the Making of Sulphate of Ammonia.

Applications, not later than the 28th inst., to be addressed to the Chairman of the Company, stating qualifications, age, salary required, references, &c.

Testimonials in the first instance are not required.

Offices, Commercial Street, Sheffield, Jan. 10, 1880.

GAS *v.* ELECTRICITY.

SHAREHOLDERS in Gas Companies should read the first number of the new Volume of *Money*, ready Jan. 7. Write for a Copy, enclosing three stamps, to Mr. MILLS, 26, Change Alley, LONDON, E.C.

PURIFIERS.

FOR SALE—A Set of Four Purifiers, 6 ft. by 4 ft. by 4 ft. deep, with valve in centre; 7-in. Connections and Sieves complete. Covers to above, nearly new. The whole being replaced by larger.

Apply to R. J. SHARMAN, Manager, Gas-Works, WISBECH

PURIFIERS.

FOR SALE—Four Purifiers, as they stand at the West Ham Gas-Works, Stratford, Essex, 14 ft. by 14 ft. by 5 ft. deep (inside measure), with Wood Sieves complete. 12-in. Connections, for working straight through and round again.

Ten 12-in. Valves, part Donkin's and part Wales and Robinson's make.

Wrought-Iron Girders and small Crab to each Purifier, for lifting cover; 4-in. Air Valves; Holding-down Screws, &c., all in good working condition, having been repaired, cleaned, and made ready for use, and capable of doing a large amount of work. Bottoms are in 9 plates, sides, 4 corner plates, 2 intermediate plates; lutes cast on to side plates.

Application to be made to Mr. EDWARD H. THORMAN, Engineer, West Ham Gas-Works, STRATFORD, E.

TO BE SOLD, Cheap, Three Telescopic GASHOLDERS, two 60 ft. diameter and 20 ft. deep each lift, and one 70 ft. in diameter and 20 ft. deep. Only been in use eight years. May now be seen at work at the Effingham Street Gas-Works, Sheffield.

For price, apply to THOMAS PIGGOTT AND Co., Spring Hill, BIRMINGHAM.

SPENT OXIDE.

TO BE SOLD by Tender, a quantity of SPENT OXIDE, loaded into railway trucks or boats at Ashton-under-Lyne.

Samples and any further particulars may be had on application to the undersigned, to whom tenders must be delivered not later than Tuesday, the 27th inst.

D. CLARKE.

Gas-Works, Ashton-under-Lyne, Jan. 9, 1880.

THE Exeter Gaslight and Coke Company have for SALE Four 12-ft. square PURIFIERS, with Lifting Crane, Valves, and Connections. The whole in working condition, and to be removed from their present position by the purchaser.

Any further information may be obtained on application to the Engineer, at the Basin Station of the Company.

By order,

W. A. PADFIELD, Secretary.

Gas Offices, North Street, Exeter,

BOROUGH OF SALFORD,

GAS-WORKS EXTENSION.—TO IRONFOUNDERS, BUILDERS, &c.

THE Corporation of Salford invite TENDERS for the Supply and Erection of the following Apparatus and Buildings, viz.:—

At the Lamb Lane Gas Station—
Contract No. 18.—New Buildings for Station Governors, Meter Stores, Workshops, and Offices.
At the Regent Road Gas Station—
Contract No. 19.—Retort Fittings and other Ironwork.
At the Liverpool Street Gas Station.
Contract No. 20.—Retort Fittings and other Ironwork.
" 21.—Condensers.
" 22.—Exhausters and Engines.
" 23.—Scrubbers and Washers.
" 24.—Purifiers.
" 25.—Meters.
" 26.—Buildings.

Plans and specifications may be seen, and forms of tender applicable to each of the above Contracts respectively may be obtained on application to the Engineer, Mr. Samuel Hunter, Assoc. Inst. C.E., Lamb Lane Gas-Works, Salford.

The Committee do not bind themselves to accept the lowest or any tender.

Tenders, endorsed with the number of each contract, and with the name of the station to which it relates, must be delivered to me on or before Tuesday, the 20th of Jan. inst.

By order,

CHRIS. MOORHOUSE, Town Clerk.

Town Hall, Salford, Jan. 9, 1880.

GAS COKE.

A LARGE QUANTITY required for delivery over a period of nine months.

Address, with price per ton into trucks at railway station, to G. J. EVESON, Gas, Coal, and Cannel Contractor, BIRMINGHAM.

GASHOLDER—30 ft. by 14 ft.—for Sale; Contents 10,000 cubic feet. Also the Framing and Sheets of a similar Gasholder, taken down in large pieces. Very suitable for roofing purposes.

Apply to the MANAGER of the St. Andrew's Gas Company, FIFE.

THE Gloucester Gas Company, ceasing to manufacture gas at their old works, will have the undermentioned APPARATUS for Sale about the beginning of August, viz.:—

110 Mouthpieces, D-shape, 13 in. by 22 in., with Wrought-Iron Lids, Cross-Bars, Stand, Bridge, and Dip Pipes. Also about 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. 28 Mouthpieces, D-shape, 16 in. by 20 in., with Wrought-Iron Lids, Cross-Bars, Stand, Bridge, and Dip Pipes. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12 in. Slide-Valves and 12 in. Connections.

Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12 in. Connections.

Exhauster (Jones) to pass about 15,000 feet per hour.

Exhauster (Beales) to pass about 25,000 feet per hour.

Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.

Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.

4-horse power Horizontal Steam-Engine.

Three 4-in. Pumps, with cranked Shafting and a pair Mitre Wheels.

Set of four Purifiers, 12 ft. by 12 ft. by 4 ft., with 12-in. Centre-Valve (Cockeys), and Connections and Lift complete.

Station-Meter by A. Wright and Co., London, with three 12-in. Slide-Valves, and 12-in. Bye-Pass and Connections, to pass about 25,000 feet per hour.

Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.

Gasholder, Double Lift, capacity 100,000 feet.

Gasholder, Double Lift, capacity 240,000 feet.

Two 12-in. Governors, by Wright, London, with 12-in Valves, Bye-Pass, and Connections.

Two 12-in. four-way faced Valves, by Cockey.

For further information, &c., apply to the undersigned.

R. MORLAND, Engineer.

NOTICE TO MANAGERS OF GAS COMPANIES.

THE LAW UNION FIRE AND LIFE INSURANCE COMPANY, of No. 126, Chancery Lane, London, grants Policies of Insurance on Gas-Works, and Buildings connected therewith, which cover risk of explosion and spontaneous ignition of Coal, on very advantageous terms. Full particulars will be sent post free on application to

FRANK M'GEDY, Secretary.

126, Chancery Lane, London.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

TO INVENTORS AND PATENTEES.

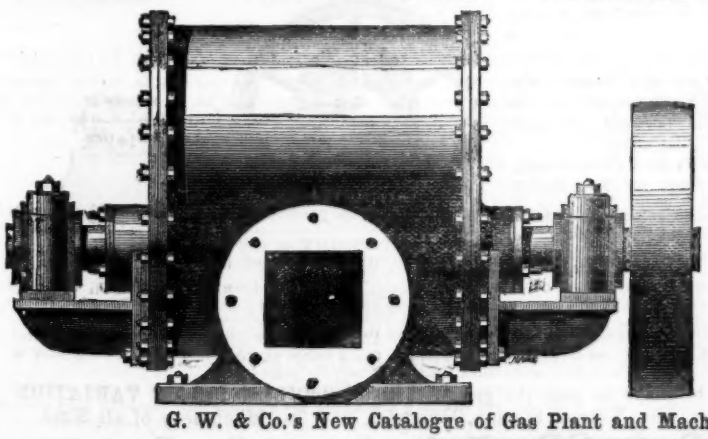
MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS,



WITH OR WITHOUT

WROUGHT-IRON SPINDLES AND

ENGINES COMBINED.

GEORGE WALLER & CO.,

MAKERS OF

ENGINES, EXHAUSTERS,
INDEX AND DISC GAS-VALVES,
HYDRAULIC MAIN VALVES,
BYE-PASS VALVES,
TAR, LIQUOR, AND OTHER PUMPS,
SCRUBBERS AND PURIFIERS,
CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

PHŒNIX ENGINEERING WORKS:

HOLLAND STREET, SOUTHWARK, S.E.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

THE

IMPERIAL METER CO.,

LIMITED,

Makers of THE IMPROVED DRY GAS-METERS, THE PATENT WET GAS-METERS, Special Meters for Public Lighting, STATION-METERS, Governors, &c.

KING'S ROAD, ST. PANCRAS,

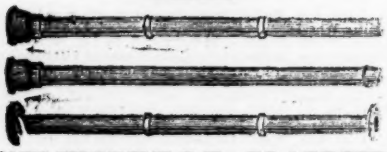
Formerly also (Walter Ford) at Gray's Inn Road.

GAS AND WATER PIPES.

WILLIAM MACLEOD & CO.,

30, ST. ENOCH SQUARE, GLASGOW.

CAST-IRON GAS AND WATER PIPES.



DELIVERY F.O.B., GLASGOW.

Prices on application.

TO GASHOLDER MAKERS.

THE Dundee Gas Commissioners are prepared to receive TENDERS for the Supplying and Erection of a TELESCOPIC GASHOLDER, in Two Lifts—the Outer to be 150 ft., the Inner to be 148 ft. diameter; each lift to be 30 ft. high.

Plans may be seen and specifications obtained by applying to the Engineer, at the Gas-Works.

The Commissioners do not bind themselves to accept the lowest or any tender.

Tenders to be enclosed, marked "Tender for Ga holder," and lodged with the subscriber not later than the 31st curt.

THOS. THORNTON, Clerk of the Commissioners.

Dundee, Jan. 7, 1880.

TO GASHOLDER-TANK BUILDERS.

THE Directors of the Kingston-upon- Thames Gas Company are prepared to receive TENDERS for the Construction of a Brick TANK, 114 ft diameter and 25 ft. deep.

Specifications and plans may be seen on application to the Engineer at the Works, Lower Ham Road.

Tenders to be sent in on or before Wednesday, Jan. 21, 1880, addressed to the undersigned, and endorsed "Tender for Tank."

The Directors do not bind themselves to accept the lowest or any tender. By order,

W. A. FRICKER, Secretary.

Gas Offices, Church Street, Kingston, Jan. 9, 1880.

M. DAVIS & CO., 27, Wellclose Square, LONDON, E.,

COMMERCIAL GLASS WORKS.

BEST OPAL SHEET GLASS, IN CASES OF 200 FEET.

150 Y	7d. per foot.	26 Y	11d. per foot.
21 Y	9d. „	32 Y	1s. 3d. „

Enamelled Sheet Glass, Flint and Opal, 1s. 2d. Coloured Glass and Opal, 1s. 6d. to 2s. 6d. per foot.

GAS GLASSES OF ALL DESCRIPTIONS ON HAND; SPECIAL PRICES FOR QUANTITIES.

J. & H. ROBUS,

BUILDERS AND CONTRACTORS

FOR THE ERECTION AND REBUILDING OF GAS AND WATER WORKS,

RETORT-SETTING—A SPÉCIALITÉ.

ROBUS'S IMPROVED RETORT-SETTINGS, guaranteed to Carbonize a large amount of Coal with a small per cent. of Fuel.

ESTIMATES GIVEN FOR MAIN-LAYING.

N.B.—All kinds of Fire Goods and Gas Apparatus supplied on the shortest notice.

Address:—J. & H. ROBUS, BELL GREEN, CATFORD, LONDON, S.E.

ECONOMY IN THE PRODUCTION OF GAS.

PLUTONIC CEMENT,

FOR JOINTING AND REPAIRING RETORTS AND OVENS *in* ACTION AND *out* OF ACTION.

A Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,

WILLIAM RICHARDSON, Gas and Hydraulic Engineer, CHARLES HENRY STREET, and BISSELL STREET, BIRMINGHAM.

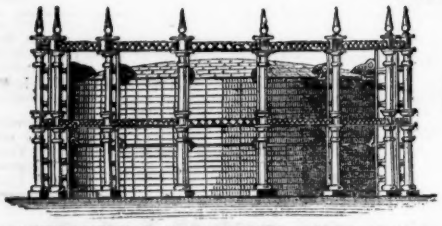
ASHMORE & WHILE,

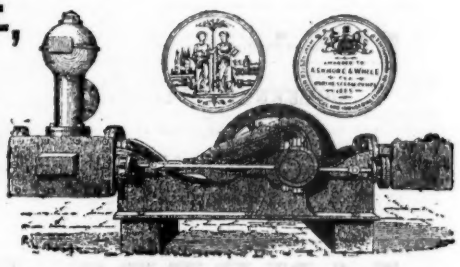
HOPE IRON-WORKS,

STOCKTON-ON-TEES,

ENGINEERS

AND MAKERS OF





GASHOLDERS & APPARATUS, references to	. .	**100 Engineers.**
ROOFS	. .	**52 Erections.**
BRIDGES & GIRDERS . .	. .	**250 „**
BOILERS	. .	**43 „**
PURIFIERS & SCRUBBERS. .	. .	**115 „**

ALSO THE

"SLIDE-VALVE" STEAM-PUMP,

For Water, Tar, Grains, Soap, Thick Fluids, Chemical, Gas, or Iron Works, Mines, Breweries, Ships, &c. No possibility of Valves sticking, as they are actuated by a positive motion from an eccentric.

References to Forty-five Users.

THE PORTER-CLARK PROCESS

FOR THE

SOFTENING AND FILTRATION OF WATER IN LARGE QUANTITIES, WITHIN SMALL SPACE, AT SMALL COST.

(*See* JOURNAL *of Jan.* 6, 1880.)

In an article upon the Swindon Water Supply, the *Wilts and Gloucestershire Standard* of Aug. 9, 1879, says:—

"All praise is due to the Company who have thus provided a water supply that, if it can be equalled, we are safe in saying cannot be surpassed. . . . For the information of all caterers for public health, we explain that the mode of so effectually Purifying and softening the really good and naturally wholesome water is the 'PORTER-CLARK PROCESS.' 'CLARK'S PROCESS' was known to be chemically admirable; the improvements, however, effected by Mr. Porter, mechanically, are curious as they are perfect."

The filtration is exquisite, and everything arrested is removed daily.

The Visiting Justices of the Kent County Asylum at Chartham on Aug. 29, 1879—

Resolved, "That a favourable testimonial be given to Mr. Porter for his system down to the present time, and that the Clerk forward a copy of this resolution to Mr. Porter." (50,000 gallons daily.)

The Visiting Justices of the Middlesex County Asylum, Banstead Downs, under date of Sept. 12, 1879—

Certify, "That up to the present time the 'PORTER-CLARK WATER-SOFTENING PROCESS,' which has been in operation at this Asylum for about two years, has satisfactorily answered the purposes for which it was intended." (60,000 gallons daily.)

(See *The Times*, Aug. 23, 1877, Paper by Mr. F. J. Bramwell, F.R.S., Meeting of British Association, Plymouth.)

The Proprietor of the *Daily Chronicle* and *Lloyd's Weekly News* writes, Sept. 17, 1879—

"The 'PORTER-CLARK WATER-SOFTENING PROCESS,' erected by you at my paper-mill at Sittingbourne, continues to give satisfaction, and I no longer have any trouble with my steam-boilers. I am not yet working the filters up to their full capacity, only softening about 80,000 gallons per 24 hours, whereas I could easily do more than 120,000 gallons. I may add that it only requires one man to attend to the whole operation."

PATENTED BY JOHN HENDERSON PORTER, C.E.,

1 & 2, TUDOR STREET, BLACKFRIARS, LONDON, E.C.

J. & J. BRADDOCK,

GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS,

OF THE HIGHEST EXCELLENCE ONLY;

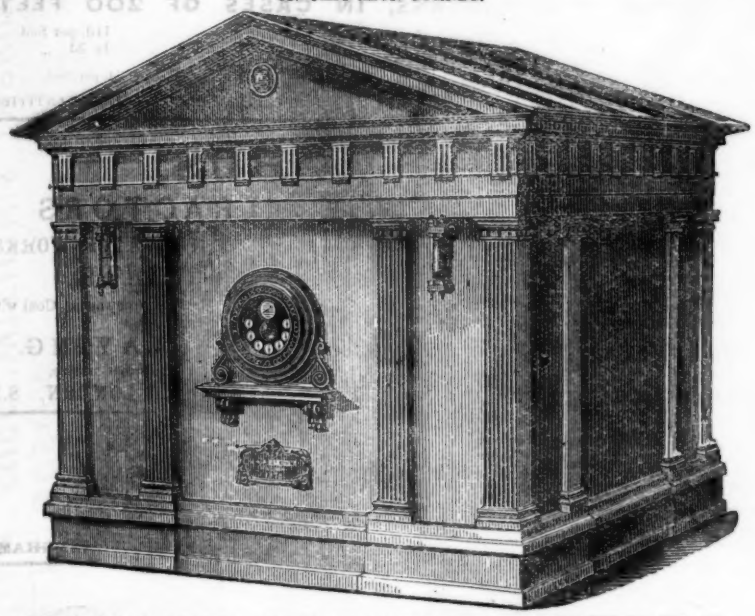
BRADDOCK'S PATENT COMPENSATING GAS-GOVERNORS;

ALSO LICENSEES AND MANUFACTURERS OF

WARNER & COWAN'S PATENT SELF-REGULATING GAS-METERS;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c., ON APPLICATION.

HENRY LYON,

MECHANICAL AND CONSULTING GAS ENGINEER,

NORWOOD, NORTHENDEN ROAD,

SALE, NEAR MANCHESTER.

SANDELL AND SON,

PUBLIC ACCOUNTANTS,

2, GREAT GEORGE STREET, WESTMINSTER.

SANDELL AND SON having been engaged during the past 25 years in Gas Companies Accounts, either in Preparing or Investigating Statements for Parliamentary Applications, Arbitrations, and otherwise, offer with confidence their Services for similar purposes.

Mr. ROBERT DEMPSTER,

CONSULTING GAS ENGINEER,

ELLAND, near HALIFAX,

May be consulted on all matters connected with Valuations, Arbitrations, and Parliamentary Applications connected with Gas-Works. Having been engaged on extensive Arbitration Cases, which, combined with his experience in Construction and Contracting, his knowledge of Engineering and Valuations is both extensive and reliable.

ALFRED LASS, F.I.Accts.,

SPECIAL ACCOUNTANT FOR GAS AND WATER UNDERTAKINGS,

80, GRACECHURCH STREET, LONDON.

Accounts Analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed by Mr. Lass to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, Corporations, and Local Boards.

THOMAS CARR & SON,

MANUFACTURERS OF

FIRE-BRICKS, LUMPS, TILES, RETORTS, &c.,

COTSWOOD FIRE-BRICK WORKS, SCOTSWOOD-ON-TYNE.

Also Makers of all kinds of Common Building Bricks, and of Pressed White and Red Bricks for Facing.

TO MAKERS OF SULPHATE OF AMMONIA AND BUYERS OR SELLERS OF GAS LIQUOR.

F. SUTTON & CO., Norwich, are now prepared to Supply a Set of Apparatus with Standard Test Solutions for the rapid and accurate analysis of Gas Liquor, which can be used by any intelligent workman, so as to show the actual amount of Sulphate which can be got out of any sample of liquor in a few minutes, without any of the annoyance arising from saturation with acid, &c. Tables are also given, showing the quantity of acid of various strengths required for any given liquor, the accurate ounce-strength and percentage of pure ammonia, &c. Price of the set, with full direction and table (copyright), with materials sufficient for fifty analyses, £4 4s.

Post orders or cheques to be made payable to F. SUTTON AND CO., Manufacturing Chemists, NORWICH, who also supply every description of Standard Solutions for Volumetric Analysis of Waters, Beers, Manures, &c., of guaranteed accuracy.

LAMBERT BROTHERS, WALSALL.

ALPHA TUBE & FITTING WORKS

Manufacturers of W. J. WARNER'S PATENT MARKET GAS STAND-PIPE.

Now ready, GAS CHANDELIER BOOK (Reduced Prices), 7s. 6d.

THE FARNLEY IRON COMPANY, LIMITED,

FARNLEY, near LEEDS,

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS & FIRE-BRICKS

Of every size and shape, and of the best quality; also of White and Coloured GLAZED BRICKS, SANITARY PIPES, &c., &c.

In order to meet the constantly increasing demand for their Gas-Retorts, the F. I. Co. have recently made such an addition to their premises as will enable them to execute expeditiously the largest home or foreign orders.

London Agent for Gas-Retorts: D. W. OGG, 3, Jeffrey's Square, St. Mary's Axe, E.C.

" " Glazed Bricks: A. BARFIELD, 22, Great George Street, Westminster.

LIVESEY FIRE-CLAY WORKS.

NEAR BLACKBURN, LANCASHIRE.

(ESTABLISHED 1835.)

ORLANDO BROTHERS, LIMITED,

MANUFACTURERS OF PATENT CLAY RETORTS,

AND EVERY DESCRIPTION OF

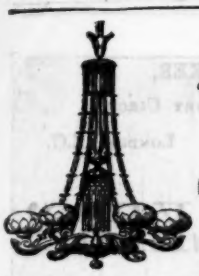
TUBULAR GLAZED SEWERAGE PIPES, BENDS, JUNCTIONS, ETC.

FIRE-BRICKS, TILES, BLOCKS, AND CHIMNEY-TOPS.

SACKVILLE STREET DUBLIN

LIGHTED FOR THE DUBLIN ALLIANCE GAS Cº BY WILLIAM SUGG WITH HIS IMPROVED SYSTEM.

The Centre Lamp is of 400-Candle Power.



F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

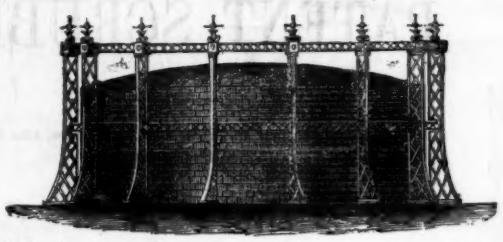
BROAD STREET, BIRMINGHAM.

ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS, WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

6, WESTMINSTER CHAMBERS, VICTORIA STREET,

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

S. OWENS & CO.,

WHITEFRIARS STREET, FLEET STREET, LONDON, E.C.,

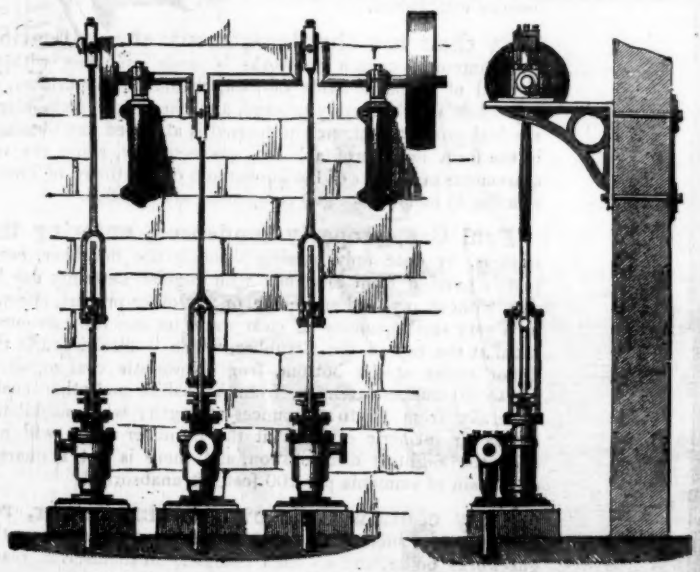
Hydraulic Engineers,

AND MANUFACTURERS OF

PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT DIRECT-ACTING STEAM-PUMPS.



IMPROVED DOUBLE-ACTION PUMPS.

For Water. For Tar. For Ammoniacal Liquor.

This illustration shows an arrangement of three (No. 179) Improved Double-Action Pumps driven from the same crank-shaft, as frequently supplied for use in Gas and Chemical Works. The suction and discharge pipes can be arranged for drawing from and delivering in any required direction.

These Pumps have been supplied to nearly all the large Gas Companies and Chemical Works, both for Pumping Water, Tar, and Ammoniacal Liquor.

GAS SYPHON PUMPS, IN COPPER OR SHEET IRON, ALWAYS IN STOCK.

Illustrated Catalogues sent post free on application.

GAS COAL.

THE Tawd Vale Colliery Company Limited, are prepared to Contract for the Supply of their superior Arley and other GAS COALS, and to send samples to the order of Gas Engineers and others, or complete analysis on application. Shipped at Liverpool, Preston, Fleetwood, Garston, or Birkenhead.

Mr. James Paterson, C.E., F.G.S., in his analysis of T. V. Arley Coal, says: "Some parts merge into a semi-Cannel; Gas per ton, 10,300 cubic feet; illuminating power, 16·96 candles; coke of high quality, 1431 lbs. per ton."

Collieries, Skelmersdale, near Ormskirk; Offices, 5, New Hall, Old Hall Street, LIVERPOOL.

W. C. HOLMES & Co.,

ENGINEERS AND CONTRACTORS

FOR

GAS AND WATER-WORKS,

HUDDERSFIELD.

REFERENCES TO UPWARDS OF 400 WORKS.

HARPER & MOORES,

PROPRIETORS OF THE

BEST STOURBRIDGE CLAYS,

STOURBRIDGE.

Manufacturers of all Descriptions of

BEST STOURBRIDGE FIRE-BRICKS, LUMPS, AND CLAY RETORTS

Of all Dimensions for Gas-Works,

GLASS-HOUSE POTS & CRUCIBLES

ESTABLISHED 1836.

The Highest Award was obtained by H. & M., at the Philadelphia Exhibition, 1876, for Superior Quality of Manufacture. SILVER MEDAL, PARIS, 1878.

E. & W. H. HALEY,

IRONFOUNDERS & MAKERS OF

CAST-IRON PIPES

FOR

GAS, WATER, & STEAM.

LISTER HILLS FOUNDRY,

BRADFORD, YORKSHIRE.

Less Heat, No Smoke,

White Light, & Economy

SPECKSTEIN & LAVA

Gas-Burner Fabricants

On the most approved French and German principles.

These Burners can be made to consume from 1¼ feet to 20 feet of gas per hour, and to give a light from 4 to 150 candle power.

Terms and Discount on application.

Catalogue, 6d. Sample Burner, 1s.

AUGUSTUS WESTWOOD & Co., COMMERCIAL CHAMBERS, WEST BROMWICH.

"TANNIC GELATINE,"

FOR

REMOVING AND PREVENTING INCRUSTATION OF EVERY DESCRIPTION OF STEAM BOILERS; ALSO CORROSION.

Manufactured only by

WILLIAM RICHARDSON,

GAS ENGINEER,

94, CHARLES HENRY STREET, BIRMINGHAM.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSES AND PRICES FORWARDED ON APPLICATION.

The Centre Lamp is of 400-Candle Power.

C. & W. WALKER,
8, Finsbury Circus,
London, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the important results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. and W. Walker, 8, Finsbury Circus, London, E.C., or to Mr. William Mann, late Superintendent of the Chartered Gas-Works, Blackfriars, London; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

THE

SILBER LIGHT COMPANY,

MANUFACTURERS OF

SILBER'S PATENT TUBULATED BURNERS

FOR

COAL OR AIR GAS,

And of SILBER'S BAT'S-WING GAS-BURNERS and every variety of Gas-Fittings.

ALSO MANUFACTURERS OF

EVERY DESCRIPTION OF LAMPS (burning Colza Oil, Petroleum, Paraffin, or Kerosene) FOR DOMESTIC PURPOSES, STREETS, RAILWAY STATIONS, SHIPS, &c., &c.

FIG. 1.
Silber's Patent Tubulated Gas-Burner, drawn full size.

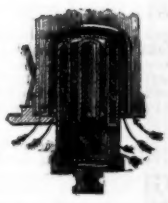


FIG. 2.
Section of Silber's Tubulated Gas-Burner, the arrows indicating the currents of air to the flame —two externally and two internally.
Dr. Wallace, F.R.S.E., Gas Analyst of Glasgow, says of this burner: "It gives the steadiest flame of any Argand yet constructed."

FIG. 3.
Silber's Tubulated Gas-Burner with glass bulb or vase beneath, and with larger inlet than aggregate outlet area, by which means the illuminating power for 5 cubic feet of 16-candle-light gas is increased one candle.

The Silber Tubulated Gas-Burner offers the following advantages over existing Argand Gas-Burners:—

1. It affords more light for 5 cubic feet of gas.
2. It is made of brass, and so put together that there is no liability of its melting, or coming to pieces in any other way, as burners made of soft metal are apt to do.
3. It is capable of burning from 4 to 7 cubic feet of gas per hour (by using chimneys of different lengths), and although the consumption be increased, **the illuminating power per cubic foot of gas remains almost quite constant.**
4. With the glass bulb or vase, as shown in fig. 3, the illuminating power for 5 cubic feet of 16-candle-light gas is **increased one candle.**

FIG. 4.
Silber's Bat's-Wing Gas-Burner.
The results obtained from this Burner are amongst the best obtained from any flat-flame Burners yet introduced.

FULL PARTICULARS & ENGRAVINGS

Forwarded on application to

THE SILBER LIGHT COMPANY,

49, WHITECROSS STREET,

LONDON, E.C.

FIG. 5.
Silber's Bat's-Wing Burner, with Opal Gas Moon.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

HARTHILL CANNEL

Yields 14,920 cubic feet of 40·92-candle gas per ton.

THRASHBUSH CANNEL

12,530 cubic feet of 40·32-candle gas per ton, and 9 cwts. of good coke.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash. This cannel is almost free from sulphur.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full analyses on application at above address, or from WEDDERSPOON, FERGUSSON AND CO., 21, Lime Street, LONDON, E.C.

HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

For references and prices, either f. o. b. or by rail, apply to

W. RICHARDSON,

29, QUAYSIDE, NEWCASTLE-ON-TYNE.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

THE

SILICA FIRE-BRICK CO.,

OUGHTIBRIDGE

Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.

BIRTLEY IRON WORKS,

CHESTER-LE-STREET, DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

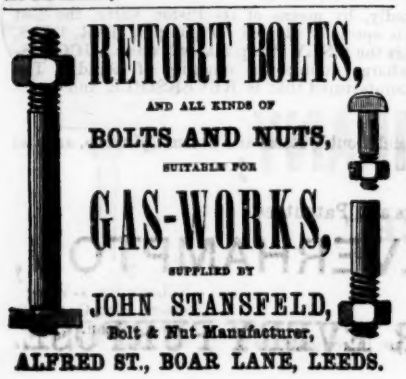
Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.

M. BREMOND'S NAPHTHALINE PROCESS.

All negotiations respecting M. Brémond's patented process for preventing Deposits of

NAPHTHALINE

in Gas Main and Service Pipes should be addressed to Mr. W. H. BENNETT, 22, Great George Street, WESTMINSTER, S.W., or to M. BREMOND, Gas Engineer, Compania Madrilena de Alumbrado y Calefaccion por Gas, MADRID, who may be consulted upon all matters connected with the Gas Industry.



RETORT BOLTS,

AND ALL KINDS OF

BOLTS AND NUTS,

SUITABLE FOR

GAS-WORKS,

SUPPLIED BY

JOHN STANSFELD,

Bolt & Nut Manufacturer,

ALFRED ST., BOAR LANE, LEEDS.

FERRAND DAVIES,

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AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

AND

NEWTON, CHAMBERS, & CO'S SILKSTONE GAS COALS.

Analyses and Quotations on application.

WILSON CARTER AND PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

Address—CHIEF OFFICES:

TEMPLE BUILDINGS, 50, NEW STREET, BIRMINGHAM.

THE

THAMES BANK IRON COMPANY,

OLD BARGE WHARF, UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS AND ALL KINDS OF GAS-WORKS APPARATUS,

SOCKET-PIPES FOR GAS OR WATER PURPOSES,

FLANGE-PIPES FOR STEAM,

RAIN-WATER PIPES AND GUTTERS,

HOT-WATER BOILERS, PIPES, AND CONNECTIONS,

LAMP-COLUMNS, LAMPS, LAMP-FRAMES, WROUGHT TUBES, &c.,

HOT WATER AND HOT AIR APPARATUS,

Erected complete on the most Improved Principles.

GAS *v.* ELECTRIC LIGHT.

WIGHAM'S PATENT GAS-BURNERS

FOR

STREET LIGHTING, &c., WHICH REQUIRE NO GLASS CHIMNEY.

Speaking of these burners, erected on the Thames Embankment, the Governor of The Gaslight and Coke Company, at the half-yearly meeting, Aug. 15, 1879, says:

"Any gentleman who may wish to see the light, may do so at the foot of Westminster Bridge, where it is in direct contiguity with the electric light, so that he will be able to judge for himself. There is a light there that completely excels the electric light in the intensity of its illumination, and in the scope of its diffusion. The lamps on Westminster Bridge are some of Mr. Wigham's."

SOLE MANUFACTURERS:

J. EDMUNDSON & CO., GAS ENGINEERS,

19, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

R. DEMPSTER AND SON'S

WOOD SIEVES FOR PURIFIERS,

WITH TAPER OR PARALLEL BARS,

MADE BY SPECIAL MACHINERY.

SCRUBBERS FILLED WITH BOARDS,

On our approved principle, for the extraction of Ammonia.

Prices on application. References to First-Class Engineers.

ROSE MOUNT IRON-WORKS,

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GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

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PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Eighteen Illustrations and Letterpress on the Construction of Gas-Works, post free, 2s. 6d.

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

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THE WIGAN COAL & IRON COMPANY,

LIMITED,

DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: W. M'GOWAN,

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

GAS COAL. GAS COAL. GAS COAL.

WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

PARIS EXHIBITION, 1878.

THREE MEDALS

AND

HONOURABLE MENTION

HAVE BEEN AWARDED TO

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For their Various Exhibits, amongst which is a

SILVER MEDAL

FOR THEIR

PATENT MACHINE-MADE

RETORTS AND FIRE-BRICKS,

Being the Highest Honour given for this class.

Established

1795.

JOSEPH CLIFF & SONS,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

London Wharf: No. 4. inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

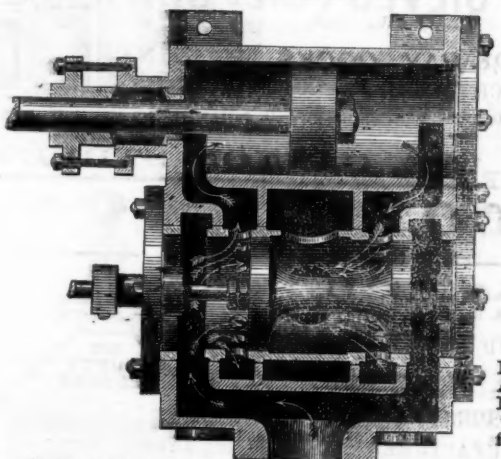
THE "RELIABLE" STEAM-PUMP

IS NOW IN USE AT NEARLY ALL THE

LEADING GAS AND CHEMICAL WORKS THROUGHOUT THE KINGDOM,

INCLUDING

THE GASLIGHT AND COKE CO., BECKTON NEW WORKS (24 supplied),
THE GASLIGHT AND COKE CO., GREAT CAMBRIDGE STREET WORKS, HACKNEY,
THE PHŒNIX GAS CO. and COMMERCIAL GAS CO., LONDON,



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and other Gas-Works.

The "RELIABLE" is undoubtedly, by means of its Piston Valve, the best Pump made for Gas-Works use. It is specially adapted for pumping TAR, OILS, AMMONIACAL LIQUOR, &c., and is the ONLY Pump that will do so SUCCESSFULLY and at the same time discharge double the quantity of liquid. The "RELIABLE" is the only Pump manufactured that is REVERSIBLE, and therefore is invaluable in frosty weather.

J. E. & SONS IMPROVED "RAM" STEAM-PUMPS, which are made with both Single and Double Rams and Steam Cylinders, are also admirably adapted for Gas-Works use.

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DRY GAS-METERS,

PRIZE MEDALS. (INVENTED & PATENTED IN 1844,) PRIZE MEDALS.

LONDON, 1851; NEW YORK, 1853; PARIS, 1855. COMBINING ALL THE LATEST IMPROVEMENTS, LONDON 1862; DUBLIN, 1865; PARIS, 1867.

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THE GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON, N.E.

CIRCULAR TO GAS COMPANIES AND OTHERS.

Stourbridge, Dec. 27, 1879.

GENTLEMEN,—As the time for ordering stock for your general requirements for next year is approaching, we beg to call your attention to the various articles of our manufacture, and to solicit your early commands.

Fire-Clay Gas-Retorts.—As some of our friends appear to prefer these *machine made*, we have arranged to supply machine-made Retorts at same price as hand-made ones. At the same time, although it is to our advantage to supply machine-made, we do not recommend them, for the reason stated to you in our Circular of November last year. We have a very large stock of Retorts, all in good condition, and of such an assortment that we could supply any size on receipt of order.

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Staffordshire Blue Bricks and Paving Bricks.—We shall be glad to submit prices and samples of these on hearing from you, with specification, and we venture to say our brand in these goods is unsurpassed. Hard Blue Paving Quarries make the best kind of Pavement for Retort-Houses, &c.

Earthenware Drain-Pipes, Cast-Iron Pipes, Wrought-Iron Tubing.—We should be glad of an opportunity of quoting you for these when you are in the market.

Coloured and White Glazed Bricks, Porcelain Baths, Kitchen Sinks, Corner Sinks, &c., we are making a great speciality of, and have no hesitation in saying that our glazed goods are unequalled for soundness of manufacture and purity of colour.

Lime, Cement, Plaster of Paris.—Our Lime Kilns at Brettell Lane are now in full operation, and we are in a position to supply any quantity of pure Lime manufactured only from the Earl of Dudley's best Limestone Beds. Our Cements and Plaster of Paris will withstand any required test.

References or Testimonials.—We can furnish you with any number. We may mention that during the last thirty-five years we supplied most of the Gas-Works, large and small, in the United Kingdom and Abroad, and that we have held contracts from Her Majesty's Government for more than Twenty years consecutively.

Awaiting your esteemed favours,

We remain, Gentlemen, your obedient servants,

HARRIS & PEARSON.

Note.—We shall be pleased to send you Drawings and Specifications, if desired, and shall be most happy to see you or any of your Engineers here at any time; or, if you would like to see any of our representatives or ourselves at your Works, we shall be glad to wait upon you by appointment.

R. LAIDLAW AND SON,

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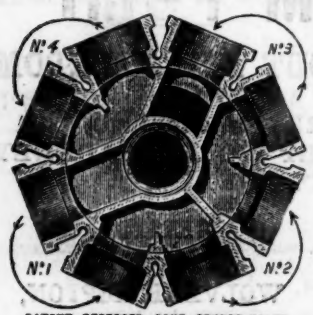
RECESSED CONE CENTRE-VALVES,

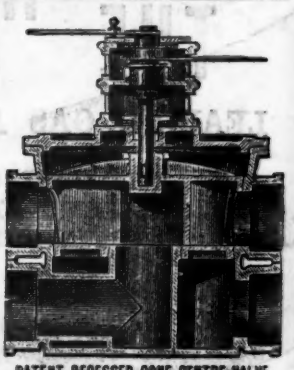
Constructed on the principle of the ordinary Plug-Cock.

THROUGH-WAY & FOUR-WAY COCKS

Of all descriptions.



PATENT RECESSED CONE CENTRE-VALVE.
Sectional Plan.



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Invite the attention of Gas Companies, Corporations, and others to their

PATENT STREET LAMPS,

Which are so constructed that neither putty nor other materials are required to secure the glass. No hacking out of old putty, which frequently destroys the frames. A new pane of glass can be inserted in two or three minutes by any inexperienced person, the glass being secured by a hinged flap and turn button.

PRICE, with Opaline Reflecting Top, 12s.; with Fluted Glass Top, 10s. 6d.
Also made EXTRA STOUT recommended for its durability.

D. HULETT'S IMPROVED SERVICE CLEANSER,

By the use of which stoppages in service and other pipes are freed from naphthaline and other obstructions in a few minutes. PRICE 73s. net.

HULETT'S PATENT MERCURIAL REGULATOR,

For inserting in mains, to prevent the excess of pressure in high ground, or other elevated positions.

PATENTEES OF IMPROVED WET AND DRY GAS-METERS.

Makers of all kinds of Pressure-Gauges, Gaseliers, and every kind of Gas-Fittings for the Trade.

GAS HEATING AND COOKING STOVES.

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London: Printed by WALTER KING, for the Executors of the late WILLIAM BOUGHTON KING (at the office of Clayton and Co., 17, Bouverie Street, Fleet Street), and published by him at No. 11, Bolt Court, Fleet Street in the City of London.—Tuesday, January 13, 1880.